ARCHIVES

MEDICINE:

ARCHIVES
OF
MEDICINE:

EDITED BY

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ADVERTISEMENT.

THE earlier years of professional life should be devoted as much as possible to the acquisition of those branches of learning which are likely to make men sound thinking practitioners,—to the storing up of facts, and to the study of principles which may be of use throughout life,—to the investigation, and if this may be, to the discovery of new truths from which fresh researches will proceed. In this way Harvey, and Hunter, and Bell, and Astley Cooper, and many other distinguished practical physicians and surgeons passed the early, and not the early years only of their professional life. Their labours prove that valuable scientific research is not incompatible with very active professional duties, and may be carried out by those who at the same time are engaged in practice, or are pursuing clinical work in Hospitals and Dispensaries.

Even if it were certain that in our own time no practical gain in relieving suffering would be derived from scientific investigation, the absence of results would be a very bad argument for abandoning our researches, seeing how many of the principles which we follow in the treatment of disease, are based upon the results of the scientific labours of those who have preceded us. It may surely be regarded as equally certain that scientific truths worked out in our own time will prove of real practical utility, if not to us, at least to our successors.

In England, such investigations are almost entirely left to the members of our profession; and perhaps no educa-

tion is better adapted to produce scientific investigators than that of the student of medicine. Compelled to study many branches of physical science, and accustomed to apply theoretical problems to practical ends, at the conclusion of his career as a student, he is in a position to select for himself that path of original investigation which his natural taste, and perhaps various accidental circumstances, seem particularly to point out to him, and in which earnestness, industry, and patience, will surely enable him to be of good service.

It has long been my hope to be able to publish, from time to time, reports of the work done in my laboratory and microscope room; but as this idea approached its fulfilment, I was led to form a more extended plan, and at length determined to ask for the help and co-operation of those who, like myself, are pursuing investigations bearing more or less directly upon medicine. Quite sure of receiving encouragement from many fellow-labourers, and fully conscious of a growing feeling in the profession of the real value and ultimate practical utility of scientific inquiry in the diagnosis and treatment of disease, I look forward with pleasure to the task of editing the "Archives," and shall feel thankful to friends who will give me any hints which are likely to increase the usefulness of the work.

The opinion has been expressed, that a journal devoted to original research and scientific investigations, in connection with medicine, would receive support; but to make many of the subjects really intelligible, the papers must be freely illustrated. I have, through the assistance of Messrs. Harrison, been able to adopt a plan, not often followed, by which illustrations may be introduced, at comparatively small cost.

It has been considered the best course to publish the first number before applying for communications, in order that some idea of the general nature of the periodical may be formed by those whose support is so much to be desired. I have, however, received communications and cases from

a few friends, to whom my thanks are specially due for this early help.

I shall introduce copious illustrations, feeling confident that drawings are really of much more use than long descriptions. I am anxious that the text should be as short as is compatible with a clear statement of the facts; and it is my desire, as far as possible, to substitute accurate representations of the objects for a minute description of their characters.

Each number will contain at least *eight octavo pages* of *lithographs*, besides several *woodcuts* inserted in the text. The illustrations will be accurate and drawn to a scale, but they will make no pretensions to artistic excellence. It is hoped, however, that their number will be progressively increased and their character improved. I shall be happy to receive suggestions and contributions for the second number, which will appear in March. If the circulation will admit of it, the price will be reduced to 2*s*. 6*d*.

Every contributor will receive 12 *copies of his communication, free of expense.*

The subjects upon which I hope to receive papers may be arranged as follows:

1. Practical clinical observations;
2. Original researches in Physiology and Pathology.
3. Results of the chemical and microscopical examination of the solid organs and secretions in a healthy and morbid state.
4. Descriptions of different processes employed for demonstrating various structures, and for carrying out scientific enquiries bearing upon medicine.
5. Condensed reports of the researches of observers published elsewhere.

L. S. B.

No. I, to be published in October, will contain the following papers, illustrated with **woodcuts, and 10 8vo. pages of lithographs.**

On the treatment of acute disease. By Dr. Todd.

On the manner in which the drawings illustrating the papers have been made. Of drawing and measuring objects in the microscope.

On the presence of cholesterine in the Urine in cases of fatty degeneration of the kidney.

On a case of chylous Urine, sent by Mr. Cubitt, with analyses and remarks on other cases of this affection.

On the importance of injecting healthy and morbid structures, and of conducting this in the simplest manner.

On preparing injected preparations of the liver, for the purpose of demonstrating its anatomy. Four plates.

On the formation of cysts in the liver. Two plates.

On the arrangement of the lobules of the liver of the ox; with two plates.

On the estimation of the quantity of urea, chlorides, sulphates, and phosphates in Urine, and of the proportion of sugar in diabetic Urine, by measuring the quantity of a graduated solution of the reagent required to precipitate the whole of the substance present. By Dr. Moritz von Bose.

Chemical and Microscopical Examination of Morbid specimens.—Cholesteatoma. Mr. Simon. Another case. Dr. May, of Reading.—Analysis of softened cerebral matter, surrounding an apoplectic clot in the left hemisphere, of the clot itself, and of the healthy portion of the brain.—Case of rape, in which spermatozoa were detected in the mucus from the vagina.—Examination of ragged, fibrin-like masses expectorated, in an obscure case of solidification of the right lung. Mr. E. Ray, Dulwich.—Examination of a large tumour connected with the thyroid of a woman, age 54. Messrs. Gibson and Bateman, Norwich.—Tumour connected with the left corpus striatum of a man, age 20. Mr. Rae, Greenwich.

The editor will be happy to receive communications for No. II, but will be obliged to any gentleman intending to contribute if he will favour him, as early as possible, with the title of his paper.

*** *All communications to be addressed to the Editor, Pathological Laboratory*, 27, *Carey Street, W.C.*

Copies will be forwarded on the morning of publication, post free, to gentlemen who send their addresses, accompanied with a remittance for 3s. 6d., to H. Barnard, 10, Grange Court, Carey Street, W.C.

LONDON: JOHN CHURCHILL.

ARCHIVES

OF

MEDICINE.

REMARKS UPON THE TREATMENT

OF

ACUTE INTERNAL INFLAMMATIONS.

(An Extract from a Clinical Lecture delivered in July, 1857.)

By R. B. Todd, M.D., F.R.S., Physician to King's College Hospital.

THE case of Jane Cook, aged twenty-two, affords a good illustration of the phenomena of disease in its most acute form. She has had pericarditis in connexion with rheumatic fever, some degree of endocorditis, and pneumonia with consolidation of about a fourth of the posterior part of each lung.

This patient is rapidly recovering, and, indeed, in an illness of unusual severity, she has had no serious drawback. On the 2nd of July rheumatic symptoms first showed themselves in pains and swelling of the lower joints. On the 6th of July a pericardial friction sound was first heard over the base of the heart, which soon became distinctly audible over its whole anterior surface. On the 7th bronchial breathing was heard at the posterior part of the lower third of the left lung, and on the 10th the right lung was similarly affected and to an equal extent. On the 12th vesicular breathing began to be audible in both lungs, and the bronchial breathing to disappear.

Now this patient was treated in the manner in which (with but slight modification) I have been for some years in the habit

of dealing with similar internal inflammations, especially those of the lungs and heart. Although my practice in such cases is now pretty well known, and I am proud to think is practised by very many of my pupils in various parts of this city and of the country, it may be useful if I take this opportunity of explaining to you the principles upon which it is based.

And first let me describe to you in detail, as a good instance of this treatment, that to which this girl Cook has been subjected.

On admission, while yet it was uncertain how far the rheumatic symptoms would extend, she was treated with alkalies and mild saline purgatives. Bicarbonate of potass in doses of from twenty to thirty grains were given every four or six hours, and very soon opium was freely given, when the cardiac affection manifested itself. As much as one grain of opium was given every fourth hour. Care was taken to keep the bowels open by giving an aperient draught daily of sulphate and carbonate of magnesia. Counter irritation was employed over the situation of the inflamed lungs by means of stupes of flannel soaked in turpentine; these were applied twice or thrice a day, and the region of the heart was freely blistered.

A principal and very important part of the treatment to which, as most of you know, I pay very special attention is that which I may call the dietetic portion. The object of this is to support the vital powers of the patient and to promote general nutrition, during the time when those changes are taking place in the frame which tend to check or to alter the morbid process, and to convert it into a healing process.

When a patient suffers from pneumonia, the tendency is for the lung to become solid, then for pus to be generated, and at last for the pus-infiltrated lung-structure to be broken down and dissolved. Such are the changes when matters take an unfavourable course. On the other hand, recovery takes place, either through the non-completion of the solidifying process, or by the rapid removal, either through absorption, or a process of solution and discharge, of the new material, which had made the lung solid.

It will scarcely be affirmed, even by the most ardent believer in the powers of the Therapeutic art, that any of the measures which are ordinarily within our reach, such as the administration of certain drugs, or the abstraction of blood, or the application of blisters, exercise a *direct* influence in effecting these changes. Save in the case of antidotes, which directly antagonise the proximate cause of the morbid state, medicines promote the cure of acute disease by assisting and

quickening some natural curative process. And he is the wisest practitioner, and will be the most successful therapeutist, who watches carefully the natural processes of cure—in other words, who studies the phenomena, both anatomical and physiological, which accompany them, and of which, indeed, they consist.

Let me, therefore, exhort you to look very carefully to this as a part of your clinical study. If you will be on the look-out, you may often meet with cases of acute disease, which recover with little or no medical treatment, and you may observe and note the clinical phenomena which they exhibit.

Allow me to anticipate your observation on this point, and to point out what you may look for in cases of pneumonia, and what you will certainly find in almost every instance.

First, the hot, often burning skin, which is so generally present in the first stages of pneumonia, will be exchanged for one bedewed with moisture, generally to the extent of free sweating.

Secondly, along with this sweating process there will be one of increased flow of urine, and very often a free precipitate of brick-dust sediment, lithate of soda, more or less deeply coloured.

Thirdly, not unfrequently expectoration becomes freer, the sputa are more easily discharged, they lose their characteristic reddish, rusty colour, and often they become very profuse and even purulent. Now and then the purulent sputa are so abundant that it is difficult to imagine that they can have come from any other source than an abscess.

Fourthly, the chemical characters of the pneumonic sputa exhibit an interesting contrast with those of the urine. In the height of the inflammatory state, the sputa contain common salt (chloride of sodium) in abundance, and the urine is entirely devoid of it. As the inflammation becomes resolved the salt returns to the urine and leaves the sputa.

Lastly, while all these changes are going on, the physiological functions which have been disturbed by the local malady, gradually approach their normal state. The quickened breathing, the accelerated pulse, the unnatural generation of heat gradually subside. As all these admit of being measured by numbers, you should tabulate them in your records of cases, and you will find on each succeeding day (under such circumstances as I am now referring to) the figure assignable to each function gradually become lower until you arrive at the normal.

Now is it not plain from all this that the process of resolution of pneumonia is a distinct natural process affected by the

various physical agencies which are concerned in the nutrition of the lung? A material which clogs the air-cells and minute tubes is removed, chemical changes of the most marked and obvious kind accompany the deposition and the removal of this material, and certain functions of excretion become strikingly augmented, as if for the purpose of getting rid of some noxious matter out of the circulation. A more exact and minute analytic chemistry than we have at present will, at some future time, beyond doubt, detect more minute changes in the blood and determine the exact nature of the discharged matters.

One other remark I must make in connexion with this subject. These acute internal inflammations are very often—I suspect always—connected with the undue prominence of some peculiar diathesis—the gouty or the rheumatic for instance—sometimes the scrofulous. Of these diatheses the main characteristic is the generation of some peculiar morbid matter which, when accumulated in undue quantity in this or that organ, gives rise to inflammation in it. And the determination of the morbid matter to the lung, or the pleura, to a joint or a muscle, will often depend on the direct influence of cold, or of an unwonted amount of exercise, or of some mechanical injury. The evil is to be remedied by the diminution of the intensity of the diathesis. This is done naturally, and is to be imitated artificially, by the elimination of the morbid element through the channels of augmented excretions, such as the sweat, the urine, and the secretions of the alimentary canal.

You will perceive, then, that my argument may be thus summed up. Internal inflammations are cured, not by the ingesta administered, nor by the egesta promoted by the drugs of the physician, but by a natural process as distinct and definite as that process itself of abnormal nutrition to which we give the name of inflammation. What we may do by our interference may either aid, promote, and even accelerate this natural tendency to get well; or it may very seriously impair and retard, and even altogether stop, that salutary process.

If, then, this view of the nature of the means by which inflammation is resolved in internal organs be correct, it is not unreasonable to assume that a very depressed state of vital power is unfavourable to the healing process. Indeed, if you watch those cases in which nothing at all has been done, or in which nothing has been done to lower the vital powers, you will find that the mere inflammatory process itself, especially in an organ so important as the lung, depresses the strength of the patient each day more and more.

(*To be continued.*)

ON THE MANNER IN WHICH THE DRAWINGS ILLUSTRATING THE PAPERS HAVE BEEN MADE, AND OF OBTAINING LITHOGRAPHS FROM MICROSCOPICAL DRAWINGS.

I HAVE always felt it very desirable that the description of scientific observations should be curtailed as far as is consistent with accuracy and perspicuity in the statement of the results, and it is my desire, as far as possible, to see drawings take the place of long and necessarily tedious descriptions of observations. Instead of alluding to the dimensions of an object in the text, the reader will be referred to the scales appended to every plate, and with the aid of very little trouble, the diameter of every object depicted may be readily ascertained. For all ordinary purposes it is only necessary to compare roughly the size of the drawing with the scale magnified in the same degree as the specimen itself, but in those instances where great accuracy is important, a pair of compasses may be used.

In comparing the representation of the same object delineated by different observers, it will be often found that great confusion has been produced in consequence of the magnifying power of the object-glass not having been accurately ascertained, and an object said to be magnified in the same degree by two authorities is not unfrequently represented much larger by one than by the other. This arises from the magnifying power of the glasses not having been accurately ascertained.

I cannot too strongly recommend all microscopic observers to ascertain for themselves *the magnifying power of every object-glass,* and to prepare, in the manner presently to be described, *a scale of measurement by which the dimensions of every object can be at once ascertained.*

The inconvenience of not being acquainted with the number of diameters which any object represented in a drawing is magnified, has been often felt; for without this it is impossible to judge of its real size. And, on the other hand, the annoyance of reading a long description of minute objects, differing slightly in size from one another, the dimensions of which have been accurately noted, is very great; while no corresponding advantage is derived from such minute measurements. The text becomes occupied with a multitude of figures of but little interest to the reader. At the same time, it is very desirable that the careful observations of different persons should be readily comparable with each other. Elaborate researches are not unfrequently deprived of much of their value in conse-

quence of measurements having been carelessly taken, or the magnifying power of the glasses wrongly expressed.

The plan of appending to every microscopical drawing a scale magnified in the same degree as the object represented, supersedes the necessity of giving measurements in the text, while it is free from any of the objections above referred to. I propose to describe briefly a very exact, and at the same time a very simple, method of applying scales to microscopical drawings. All the drawings illustrating the editor's papers may be measured by the scales at the bottom of the page, and he strongly recommends all contributors to follow the same plan.

To carry out this it is necessary to ascertain the magnifying power of every object-glass, and to be provided with a stage micrometer divided into 100ths and 1000ths of an inch.

*Mode of ascertaining the magnifying power of the object-glass.**—A glass micrometer divided into 100ths of an inch is placed in the focus of the object-glass of the microscope, which is arranged horizontally. The neutral tint glass-reflector is fitted to the extremity of the eye-piece, and the light carefully arranged so as to render the micrometer lines distinctly visible. Care must, however, be taken that the distance from the object-glass to the reflector is the same as from the latter to the paper beneath it, upon which the magnified micrometer lines may now be traced. A four or six-inch scale accurately divided into 10ths of an inch is now applied to the magnified 100ths of an inch, and the magnifying power of the glass is at once ascertained. Suppose each magnified 100th of an inch covers 1 inch, the magnifying power will be 100 diameters, if an inch and 3 tenths 130 diameters, if 4 tenths of an inch 40 diameters, and so on, each 10th of an inch corresponding to a magnifying power of ten times.

If we wish to ascertain the magnifying power of one of the higher object-glasses, a micrometer divided into 1000ths of an inch should be employed instead of the one just alluded to. In this last case, each tenth of an inch upon the scale corresponds to a magnifying power of one hundred, instead of ten diameters. Any fractional parts can be readily estimated if we have a very accurately divided scale. This process must be repeated for every object-glass, as well as for each different eye-piece employed with the several objectives.

To ascertain the Diameter of an Object.—If an object be

* This mode of measuring is alluded to in several works on the microscope, but the editor considers it sufficiently important to repeat here, especially as the drawings illustrating papers published in the "Archives" have been copied in this manner.

substituted for the micrometer, and its outline carefully traced upon paper, its dimensions may of course be easily ascertained by comparison with the micrometer lines. The magnified power used being the same in both cases.

In order to apply this plan to microscopical drawings generally, the following seems to be the simplest method of proceeding, and saves much trouble. Scales are carefully drawn upon gummed paper; the magnifying power, and the micrometer employed, being written against them as represented in the plates. If a number are drawn together one of the rows can be cut off and appended to the paper upon which the drawing, magnified of course to the same degree, has been made. This is the plan I have followed in all the drawings which illustrate my observations, and the scales have been copied in the lithographs. All magnifying glasses of the same focus do not magnify in precisely the same degree, so that it is necessary for every observer to ascertain for himself the magnifying power of his lenses, and he may construct little tables in the manner I have described.

In order to make an accurate microscopical drawing, the image of the object is carefully traced on paper with the aid of the glass-reflector, and afterwards finished by the aid of the eye alone. In order to obtain the size accurately, care must be taken that the distance between the reflector and the paper is the same as that between the former and the object-glass. The drawing having been finished, one of the scales made as above described may be gummed on in one corner of the paper.

Of Drawing Objects in the Microscope, from which it is intended to take Lithographs.—The lithographs illustrating the papers in the present number have been made by copying the image, with the aid of the reflector, on transfer-paper, with lithographic ink or chalk.*

The drawing on the transfer-paper being complete, is transferred to a finely grained lithographic stone and properly fixed; impressions may then be taken off.†

* The best transfer-paper for this purpose is made of India paper. The ink and chalk can be purchased at any lithographer's. Fluid lithographic ink answers very well, and was used in making the drawings.

† The drawings have all been carefully copied from the objects themselves on transfer-paper in my house, and then transferred to the stone. The transfers have been made and the impressions printed off by Messrs. Harrison and Sons, of St. Martin's Lane, and it is only right that I should thank those gentlemen for the trouble and interest they have taken, and for the kindness which they and their workmen have always shewn in carrying out this plan of producing the drawings, as well as other suggestions which have been made.

ON THE PRESENCE OF CHOLESTERINE IN URINE.

SOME years ago, when examining the fatty matter which accumulates in the epithelial cells passed in the urine in considerable number in cases of fatty degeneration of the kidney, I was surprised to find that it contained a considerable quantity of cholesterine. This fact was stated in an introductory lecture which I gave in November 1852, and I propose now to describe the method employed for its detection, and to consider briefly one or two questions of interest connected with the presence of this substance in the urine. The only cases in which cholesterine seems to have been detected in urine are those which are referred to in Simon's chemistry. Gmelin is said to have found cholesterine in the urine in a case in which the flow of bile was impeded, and Möller twice detected it in kiestein, the film which rises to the surface of the urine of pregnant women, and contains sometimes much fatty matter.* It is not stated, however, if the crystalline form of the crystals was made out.

Other authorities, among whom is Lehmann, state that cholesterine has not been detected in urine.

The first case which I examined was that of John Ryan, a patient in King's College Hospital in 1850, under the care of Dr. Todd. The urine was pale, of acid reaction, specific gravity 1020, and contained albumen. The pale flocculent deposit consisted principally of fat cells.

The deposit from upwards of seven gallons of urine was collected upon a filter. It was dried over a water-bath, and digested in a mixture of alcohol and ether. The solution was filtered, and after being concentrated by evaporation, was allowed to cool. Crystals of cholesterine were formed in considerable number. These were subjected to microscopical examination. The fatty matter in this case was found to be composed of at least three distinct forms of fat, but in consequence of the very small quantity obtained for observation, it was not possible to examine their characters very minutely. The deposit from this urine contained—

1. A dark brown fat in very small quantity which was soluble in ether, but insoluble in hot and cold alcohol.

2. A light brown saponifiable fat, soluble in hot but insoluble in cold alcohol.

3. A considerable quantity of pure cholesterine, which originally existed in the urine dissolved in the other fats.

The next case of fatty degeneration of the kidney submitted

* Casper's Wochenschr: January 11—18, 1845, quoted in Franz Simon's Animal Chemistry, vol. ii. pp. 318, 333.

to examination was that of a man named Tiedeman, also a patient of Dr. Todd's, in King's College Hospital. The fatty matter obtained from 24 pints of urine weighed only ·47 grs., but from this a great number of crystals of cholesterine were obtained by extraction with alcohol.*

The deposit of the urine of a third case of fatty degeneration of the kidney has been submitted to examination, and cholesterine has been discovered in this instance also.

In one case in which the deposit had been kept for some time in a preservative fluid consisting of wood-naphtha, creosote, and water, the cholesterine had separated from the other constituents of the oil globules, in the form of rhomboidal tablets.

The fatty matter deposited in the kidney in these cases also contains a large proportion of cholesterine, and in a future communication I propose to give the results of chemical analyses of the kidney in fatty degeneration. I have detected the presence of cholesterine in the fatty matter of so many organs in a state of fatty degeneration as to justify the conclusion that the formation of this substance is intimately connected with the changes taking place in this morbid process.

When cholesterine occurs in the urine it is always dissolved in other fatty matters, so that its presence cannot be detected except by extraction with alcohol and subsequent crystallization. It forms a part of the constituents of the minute fat globules contained in the epithelial cells and casts of the uriniferous tubes, which Dr. Johnson has proved to be so characteristic of this form of kidney disease.

Surprise has often been excited by observing that oil globules passed in the urine in these cases, sink to the bottom of the vessel, when we should expect rather to find the fatty matter rising to the surface by reason of its lightness. That the cell-walls, and casts, are not the sole cause of this subsidence is proved by the fact that individual oil globules, quite free from these structures, are frequently found at the bottom of the vessel with the deposit. This subsidence is probably in some measure due to the quantity of the cholesterine entering into the composition of the fatty matter. Crystals of cholesterine sink in fluids of a specific gravity even some degrees above 1000.

I have not been able to detect cholesterine in the urine in any other morbid condition than in that above referred to. Although I have at present only searched for it in four cases of fatty degeneration, in consequence of the difficulty of obtaining

* Clinical lectures on certain diseases of the urinary organs and on dropsies, by Dr. Todd.

sufficient quantity of the deposit to work upon, the circumstances which I have enumerated render it very probable that it is a constituent of the fatty matter present in the urine in all cases of fatty degeneration of the kidney.

I shall have occasion to describe elsewhere the characters of the fatty matter present in other tissues in state of fatty degeneration, but I may remark here that cholesterine is a very constant constituent, and I have detected it in the large cells (*granular corpuscles*) containing oil globules, which are abundant in the fluid of *ovarian dropsy, and sometimes in hydrocele,* and in that found in cysts generally;* in similar cells which are common in *sputum,* and are derived from the surface of the mucous membrane of the bronchial tubes; in the cells which are frequently very numerous about the *small arteries of the brain* in cases of *white softening,* in those found in cases of the so-called *fatty degeneration of the placenta,* and in other situations.

CASES OF CHYLOUS URINE—ANALYSES OF TWO SPECIMENS OF THE URINE.

FOR the notes of the following interesting case, as well as for the specimens of urine which I analyzed, I am indebted to my friend Mr. Cubitt, of Stroud. As cases of chylous urine are so rare in this country, I think it desirable to publish the history of the patient. Most of the cases recorded have occurred in the inhabitants of warm climates, or in persons who have lived for some time in hot countries.

"Mrs. S——, aged 50, native of Norfolk, in which county she has always resided, has been married 29 years, and has had five children, the last of which died in its second year. The youngest now living is 20. The catamenia ceased at 43.

"Till within the last four years she has usually enjoyed good health, but at that time had a severe attack of influenza. She continued more or less out of health during the six or nine following months, and soon after this period her urine assumed a milky appearance, which character it has retained up to the present time (November 1849), except at intervals of unfrequent occurrence and of short duration. The disorder would seem to

* The bodies described as *granular corpuscles, inflammation globules, compound granular cells, exudation corpuscles,* and known by other names, are really composed of a number of minute oil globules, aggregated together in the form of a spherical mass which not unfrequently becomes invested with albuminous matter, resembling a cell-wall, but I believe that usually the albuminous material is deposited with the oil globules, and therefore that no true envelope or *cell-wall* exists.

have been gradually progressive, as the urine, which was at first only turbid and opalescent, has become by degrees more and more opaque, so that when I saw it, the unassisted eye could not distinguish between it and milk: moreover, after the lapse of a few days, a rich kind of cream rises to the surface. It is almost entirely free from any urinous odour, and has a faint, sweetish smell, something resembling that of ripe apples In the mean time the general health has been more and more failing, and the digestive functions imperfectly performed; the patient has complained of loss of appetite, pain at the epigastrium after eating, slight headache with nausea, palpitations, and other dyspeptic symptoms. She has been losing flesh, suffers from pain in the back and loins without tenderness, from aching of the limbs, incapability of exertion, and other evidences of general debility, but still when the duration of the disease is taken into account, the general health may, upon the whole, be said to have suffered little. She states that throughout the affection, fatigue, whether of mind or body, unusual exertion, excitement, late hours, distress, anxiety, immediately renders the milky character of the urine more marked. She has been under the care of several medical men, as well as of some professed quacks (none of whom have ever examined the urine) without benefit; nevertheless, she has found that for the time, brandy and isinglass, or compound spirits of lavender, has never failed to clear the urine, but without at all improving the general health. She seems to derive *temporary relief from all kind of stimulants.* Occasionally, and without any apparent cause, the urine reassumes its ordinary appearance, but this is of rare occurrence, and its duration never exceeds two or three days. At no one time has she passed milky urine *during the day.* It is only the urine passed in the morning, after the night's sleep, which has ever presented a milky character. Occasionally, this urine settles down into a tremulous jelly, which takes the shape of the containing vessel, and more than once this spontaneous coagulation has taken place within the bladder itself; and in consequence of the impaction of small masses in the urethra, the patient has suffered from temporary retention of urine. She has tried various kinds of diet, but without any visible effect upon the urine. The quantity secreted appears normal, and there is no unusual frequency of micturition. The appetite has never been inordinate, or the thirst unnatural; the bowels are inclined to be costive. There is nothing remarkable about the state of the skin. She has suffered a good deal from pain in the back and loins, but there is no tenderness in this locality, and the uneasiness seems to depend upon exertion, and appears to

be connected with general debility. There has never been any dropsy, and she has suffered from no cardiac or pulmonary symptoms, but such as may be accounted for by the dyspepsia; but I have not had an opportunity of examining the chest. She has never had severe headache, vertigo, vomiting, or other cerebral symptoms. Has never had rheumatism, fever, or any inflammatory attack, has not been salivated, and has no reason to suppose she has suffered from exposure to cold. At the time when I saw her, the tongue was slightly furred, P. 70, small and soft, R. 20 and the skin cool, but there was a haggard appearance about the countenance, and a dark circle around the eyes, with slight bagging of the skin in this situation."

Mr. Cubitt inquired as to this patient's state in April 1857, and informed me that occasionally she passes chylous urine, but only for a short time. The symptoms seem to have become less marked. She has been taking no medicine, and latterly has been in better general health than for several years past.

The first specimen of urine was passed in the morning. It was perfectly fluid, and had all the appearance of fresh milk. It had neither a urinous smell nor taste. Upon the addition of an equal volume of ether it became perfectly clear, but when the ether was allowed to evaporate by the application of a gentle heat, the fatty matter could be again diffused, by agitation, through the urine, which regained its milky appearance although it appeared rather more transparent than before the addition of the ether. Upon examination, however, by the microscope, instead of the minute granules visible in the first instance, numerous large and well-defined oil globules were observed.

Specific Gravity 1013. *Reaction*, neutral.

A little of the urine was evaporated to dryness. The dry residue was very greasy to the touch. It was treated with ether, and upon evaporating the ethereal solution, a considerable quantity of hard and colourless fat was obtained.

The urine was found to contain in 1000 parts—

Water	947·4	
Solid matter	52·6	
Urea	7·73	
Albumen	13·00	
Extractive matter with Uric Acid	11·66	
Fat insoluble in hot and cold Alcohol, but soluble in Ether	9·20	13·9
Fat insoluble in cold Alcohol .. .	2·70	
Fat soluble in cold Alcohol	2·00	
Alkaline Sulphates and Chlorides....	1·65	
Phosphates	4·66	

The second specimen was passed during the same day. It was slightly turbid, but contained a mere trace of deposit consisting of a little epithelium, with a few cells larger than lymph corpuscules, and a few small cells, probably minute fungi. Not the slightest precipitate was produced by the application of heat, or by the addition of nitric acid.

Specific Gravity 1010. *Reaction,* very slightly acid.

In 1000 parts it contained:—

Water	978·8	
Solid matter	21·2	
Urea	6·95	
Uric Acid	15	
Extractive matter	7·31	
Alkaline Sulphates and Chlorides	5·34	
Alkaline Phosphates	1·45	1·60
Earthy Phospates	·15	

The presence of so large a proportion of fatty matter (13·9 grs.) in the first specimen and its complete absence in the second, should be noted.

The proportion of the constituents in 100 grains of the solid matter of these two specimens of urine is given in the following table; I, is the chylous, II, the clear specimen:—

	I.	II.
Solid matter	100·00	100·00
Urea	14·69	32·78
Albumen	24·71	—
Extractive matter, Uric Acid	22·17	35·18
Fatty matter	26·43	—
Alkaline Sulphates and Chlorides....	3·14	25·18
Phosphates	8·86	7·54

Microscopical Characters of the Deposit.—The slight deposit which formed after the chylous urine had been allowed to stand for some time in a conical glass vessel, consisted of a small quantity of vesical epithelium, and some small slightly granular circular cells about the size of a blood corpuscle.

No oil-globules could be detected upon the surface of the urine or amongst the deposit, and the fatty matter, which was equally diffused throughout, was in a molecular or granular form. By examining the urine with the highest powers, only very minute granules could be detected. These exhibited molecular movements. Indeed, it may be said, that the microscopical characters of this urine closely resembled those of chyle.

Only a few of the granular cells could be discovered in the clear specimen, in which there was scarcely any visible deposit.

In a case which occurred in the practice of Mr. Gossett, and which is related by Dr. Golding Bird, an alternation in the character of the urine similar to that noticed in the present case occurred. The urine which was passed in the morning was chylous, while that secreted some hours afterwards was clear, pale, and transparent. The clear specimens, however, contained albumen. The chylous specimen which I examined did not coagulate spontaneously, as often occurs in these cases. In the case reported by Dr. Bence Jones, specimens of urine were frequently passed which were perfectly clear.

L'Heretier, and the late Dr. Franz Simon, of Berlin, state that these specimens of milky-looking urine contain oil globules, but the greater number of authors who have met with such cases have failed to detect oil globules in the urine. In the present instance they were certainly absent, and the fatty matter existed in a molecular form only.

In Dr. Bence Jones' case, oil globules were present in one or two instances, but in other specimens the fatty matter was present in a molecular state.

In true cases of chylous urine, the fatty matter, in a molecular state, filters through the walls of the vessels, and escapes at once into the urine, while in those instances in which actual globules are observed, the fatty matter is absorbed into the interior of the cells, where it remains a sufficient time to become converted into distinct oil globules. Globules thus formed may afterwards become separated from each other and may appear in the urine as free oil globules. It is, however, very probable, that after chylous urine has been allowed to stand for some time, the granular fatty matter may become aggregated in masses so as to form distinct oil globules.

In a case of albuminous and fatty urine reported by Dr. Bence Jones,* oil globules and streaks of oil were detected upon the surface of the urine which was passed in the morning, by microscopical examination. In two other specimens passed later in the day, fatty matter in a molecular form, but no oil globules, were discovered. Upon standing, a coagulum formed in the urine. These specimens contained about 50 grains of solid matter in 1000 of urine. The patient was a Scotchman, aged 32. His work was hard, and he was subject to privations. The urine was first observed to be thick and white about Christmas 1848, and at this time, the chief symptom from which he suffered, was acute pain in the loins.

Many of the patients whose cases are recorded, have suf-

* Vol. 3 of the "Medico-Chirurgical Transactions."

fered from severe pain in the region of the kidneys; but this may be accounted for by general debility, associated with this condition of urine, as well as on the supposition of the existence of organic disease of the kidneys. Indeed, the pain referred to in this locality, seems to partake more of the character of muscular pain than of pain seated in the kidneys themselves.

The following are two analyses of the urine in Dr. Bence Jones' case.

The first was made on October 19th, and the second was passed some time afterwards on the same day on which the patient was bled.

Water ...	955·58	943·13
Solid matter	44·42	56·87
Albumen	14·03	13·95
Urea	13·26	24·06
Fatty matter	8·37	7·46
Saline residue	8·01	10·80
Loss	·75	·60

The chylous urine contained blood corpuscles.

The serum of the blood was not milky, but the blood contained in 1000 parts 240·03 of solid residue, which contained of fatty matter ·62; fibrin, 2·63; blood globules, 159·3; solids of serum, 78·1.

Dr. Bence Jones showed, in some valuable experiments on this case, that in complete rest albumen ceases to be passed.*

The urine was not chylous from February 14th, 1850, to October 4th, 1851, when it was again slightly chylous. The beneficial change was entirely attributable to *gallic acid*. At first 20 grains three times a-day were given, but this was afterwards diminished.

Dr. Bence Jones mentions another case of a gentleman aged 40, who passed the greater part of his life in the West Indies. The chylous condition of the urine was increased both by mental and bodily exertion.

The urine was sometimes clear for several days together, sometimes white after dinner, and clear all the rest of the day. It was more frequently chylous after animal than after vegetable food.

Another case is reported by Dr. Priestly.†

The boy was only 11 years of age. He was born at the Cape of Good Hope, and was taken as a child to the Isle of France, and while there had frequent attacks of hæmaturia and chylous urine. The attacks came on at intervals of weeks or months. He was placed in the autumn of 1855 under the

* Phil. Trans., 1850. † Med. Times and Gazette, April 18th, 1857.

care of Dr. Simpson of Edinburgh. Various plans of treatment were tried in vain. He was confined to the house, and passed as much as 50 to 55 ounces of chylous urine daily. He gradually became weaker, and died apparently from asthenia.

A fortnight before death the urine lost its milky appearance and the feet became œdematous.

Every tissue appeared bloodless, and there was considerable emaciation. The kidneys were pale, rather larger than natural. Throughout the greater part of both kidneys the epithelium was found to contain numerous oil globules.

Dr. Priestly suggests the possibility that this case of chylous urine may have been associated with Bright's disease.

No lesion likely to account for the production of the chylous urine has been met with in the post-mortem examinations of the cases of this condition which have been made, and most observers consider that the chylous condition of the urine does not depend upon a morbid state of the kidneys. Dr. Elliotson, on the other hand, inclines to the view that the kidneys are to be regarded as the seat of the affection. He gives the history of a very interesting case in the "Medical Times and Gazette" for September 19th, 1857.

Various plans of treatment have been tried in cases of chylous urine, but without very satisfactory results.

Astringents have proved useful in many instances, and in one of Dr. Bence Jones' cases the pressure of a tight belt "relieved the pain and rendered the urine slightly less chylous."

Dr. Prout found that in some of his cases temporary relief resulted from the use of the mineral acids and astringents, as alum and acetate of lead. Opium also arrested some of the symptoms for a while. Dr. Bence Jones has tried a variety of remedies, but the greatest advantage seems to have been derived from the use of astringents. Tannic acid, acetate of lead, and nitrate of silver were employed. Matico afforded some relief, but the most valuable remedy in Dr. Bence Jones' hands was gallic acid. Its good effects were probably due to its astringent properties and not to any specific action. The chylous character of the urine and the albumen disappeared two days after the commencement of the use of this drug, and one case seems to have been cured by its long-continued use.*

In Dr. Priestly's case the gallic acid caused such nausea that it was considered expedient to abandon its use.

Gallic acid was also tried by Dr. Goodwin of Norwich, in a case which came under his care. He says "gallic acid ap-

* For the results of a daily examination of the urine for some weeks while the patient was on gallic acid, See Phil. Trans., 1850.

peared to exert great influence in restraining the milky appearance of the urine. The patient took it for about 9 months in 1855 and 1856, and I found his water perfectly normal in colour after 6 months' steady use of it in doses of ½ a drachm 3 times a-day. He then discontinued its use and went to work. In 4 or 5 days the same milky appearance presented itself, and was again removed by taking the gallic acid. He could at any time render the urine nearly normal in appearance by taking this drug; but it was necessary to avoid hard work. He only complained of occasional dimness of sight and deafness, but it was not easy to make out to what cause these symptoms were due. He left off attending the hospital in September last, when my note is as follows: "Has not had any gallic acid for 3 weeks, and the urine is now slightly opaline in appearance. Sp. gr. 1010; the temperature of air was about 50°. He passes 7½ pints daily on the average. It does not coagulate with heat or nitric acid, or both combined."

Dr. Goodwin has not been able to ascertain anything of the further history of the case since September.

The very large quantity of fatty matter present in the first specimen of urine, and its total absence in the urine passed only a few hours afterwards, is remarkable in the case which has been reported, page 12, and confirms the conclusions which previous observers have arrived at with reference to this condition, viz., that the fatty matter appears in largest quantity after the absorption of chyle, although in Dr. Bence Jones' case it did not appear to be associated with any fatty condition of the blood. In Mr. Cubitt's case we may, I think, conclude that there is no organic disease of the kidneys.

First, from the absence of any symptoms.

Secondly, from the microscopical characters of the deposit; and

Thirdly, from the fact that albumen was only present when the urine contained the fatty matter.

With regard to the *treatment* of cases of chylous urine, it has been stated that the use of astringents has afforded much benefit. Gallic acid has been productive of very great relief in several, and probably in one, of permanent cure, but it is not equally applicable to all cases.

Upon reviewing the chief points in this and other cases, one is led to conclude that the condition does not depend upon any permanent *morbid* change in the secreting structure of the kidney, and that the chylous character of the urine is intimately connected with the absorption of chyle. The debility and emaciation shew that the fatty matter, albumen, and other

nutritive substances are diverted from their proper course, and removed in the urine instead of being appropriated to the nutrition of the system. Whether these materials are separated from the blood by the kidneys, or find their way to these organs by some more direct course, cannot now be decided.

Note.—Practitioners who have opportunities of examining many of these cases in the West Indies might probably afford much assistance in ascertaining the nature of this curious condition if they would make careful reports of the most marked cases. In post-mortem examinations the serum of the blood should be collected and allowed to stand, in order to see if it were milky or not. The state of the mesenteric glands, lacteals, and receptaculum chyli should be particularly examined, and it would be desirable to inject the thoracic duct, first with transparent fluid injection, and afterwards distend it with a little strong size, when the course of the absorbent trunks might be traced, and if necessary, parts subjected to microscopical examination.

REMARKS ON INJECTING HEALTHY AND MORBID STRUCTURES, AND OF EFFECTING THIS IN THE SIMPLEST MANNER.

IN the investigation of healthy and morbid structures many points of great importance can only be made out by examining injected preparations. From their extreme tenuity and perfect transparency, the capillary vessels of many tissues are not distinguishable as such in preparations examined in the ordinary way. By looking at uninjected preparations we may sometimes be led to conclude that a tissue is only slightly vascular, when it is abundantly supplied with vessels, and in other cases we may describe as a fibrous matrix or supporting frame-work, a tissue which is composed almost entirely of a dense net-work of capillaries. Capillary vessels when uninjected are often collapsed, and in the manipulation necessary for preparing a microscopical specimen, are inevitably pressed and somewhat stretched and torn. In such a specimen, the vessels cannot be distinguished from a form of fibrous or connective tissue which is very common, and in not a few instances have been so described. In investigating the anatomy of morbid growths still greater confusion has arisen from the same cause, and it is hardly to be expected that we shall be able to ascertain the nature of these, or the history of the various stages through which a particular structure passes in the

course of growth, until the arrangement of the vessels has been accurately made out, and the precise relation which the most important anatomical elements of the tissue bear to them. It is obviously impossible to ascertain these points unless the vessels are filled with some coloured material which renders them less transparent than in the natural state, and it is at the same time quite clear that they must not be filled with any opaque material, for this would prevent the possibility of the surrounding structures being seen at the same time. For investigations, therefore, of this class, the materials usually employed for injecting the capillary vessels, such as vermilion, chromate of lead, and other opaque colouring matters, are inadmissible. Neither can the tissues be dried and mounted in Canada balsam in the manner in which vascular preparations are usually preserved, because delicate structures are invariably altered or destroyed by this process.

In order to inject satisfactorily the most minute vessels of a tissue, and at the same time to demonstrate their relation to adjacent structures, one must be provided with an injecting fluid which possesses the following properties:—The fluid should be of such a consistence that it will run readily through the smallest vessels. It must contain a certain amount of colouring matter to render the arrangement of the vessels distinct, but must be sufficiently transparent to admit of the examination of the specimen by transmitted light. The colouring matter must not be soluble, for in this case it would permeate the tissues indiscriminately, and would thus prevent the vessels from being distinguished from other textures. Though insoluble, the particles of which the colouring matter is composed must be so minute as not to exhibit distinct granules when examined with the highest powers, for if this were so, the specimen would have a confused appearance. The fluid in which the colouring matter is suspended, must be capable of permeating the walls of the vessels, with tolerable facility. It must possess a certain amount of refractive power, and a density approaching to that of the fluid which surrounds the tissues in the natural condition. It must be of such composition that it may be employed without the application of heat.

The injecting fluid must not escape too readily from the numerous open vessels necessarily exposed in cutting a thin section of the tissue for examination, and particles accidentally escaping ought not to adhere intimately to the surface of the section, for this would render the specimen confused and indistinct when subjected to examination. The fluid employed must not interfere with the preservation of the specimen, and

it ought not to undergo any alteration by being kept for some time. It should be readily prepared.

The injected specimens must permit of examination with a power of at least 200 diameters.

In searching for a fluid possessing all these different properties, many experiments have been made. The fluid which I employed in my investigations upon the anatomy of the liver possesses the various qualities required, and is applicable for making minute injections of the capillaries as well as the ducts of glands. This fluid consists of Prussian blue in a state of very minute division suspended in a solution which also acts the part of a preservative fluid. The particles of blue are quite insoluble, so that they will not pass through basement membrane, but at the same time they are so minute that when examined by a very high power, the precipitate appears uniform and homogeneous. It is not easy to wash this fluid out of the vessels when a section of the injected tissue is prepared. It runs very freely. It can be kept for a length of time without being impaired, and can be used at once. Before injecting the tissue, no warming is necessary as in the use of size injections, and the preparation may be examined immediately after the injection has been completed. The fluid is inexpensive, so that small portions of an organ may be efficiently injected, in which case a considerable quantity of the injecting material must necessarily escape from the divided vessels and be wasted. It tends to harden the coats of the vessels as it passes through their channels, while at the same time it increases the transparency of the specimen. The colour is not affected by acids, but is removed by alkalies. Capillaries thus injected may be examined by the eighth of an inch object-glass.

I have given the composition of this fluid elsewhere, but as it is applicable for general purposes, and is peculiarly adapted for injecting morbid growths, I am anxious that all engaged in anatomical and pathological inquiries should test the value of this plan of preparing injected specimens, and I therefore subjoin the composition of the fluid.*

* Glycerine	1 oz.
Wood-naphtha or pyro-acetic spirit	1½ drachms.
Spirits of wine	1 oz.
Ferrocyanide of potassium	12 grs.
Tincture of sesquichloride of iron	1 drachm.
Water	4 oz.

The ferrocyanide of potassium is to be dissolved in one ounce of the water, and the tincture of sesquichloride of iron added to another ounce. These solutions should be mixed together very gradually and well shaken in a bottle, *the iron being added to the solution of ferrocyanide of potassium.* When thoroughly

Specimens injected with this preparation may be preserved in any of the ordinary preservative solutions, but I give the preference to glycerine or glycerine-jelly. They may also be dried and mounted in Canada balsam, if desired.

Lately I have succeeded in making very satisfactory injections of malignant growths, and even hard fibrous tumours, with Prussian-blue solution. I would, however, recommend the observer to inject the kidneys of the sheep or pig, the eye of the ox, frogs, and other small animals, before attempting the more difficult operation of injecting tissues in a morbid state.

ON PREPARING INJECTED PREPARATIONS OF THE LIVER FOR THE PURPOSE OF DEMONSTRATING ITS ANATOMY.

PLATES I, II, III, IV.

SINCE the publication of my paper in the Phil. Trans. for 1855, and memoir upon the anatomy of the liver,* some observers of high authority have expressed a doubt as to the possibility of forcing water through the vessels to the extent advocated in my paper, without their rupture, and the destruction of the other structures. I have, therefore, carefully repeated the plans which I followed, several times during the last year, and have in every instance confirmed the results which I previously arrived at, and have met with even greater success in preparing demonstrative specimens than before. I propose in the present paper to describe the method of proceeding, in order to demonstrate the anatomy of the liver. In this particular instance a pig's liver was operated on, but the process would be precisely the same in making injections of the livers of other animals.

Injection of the Liver with Water.—A large pig's liver within half an hour after its removal from the animal was arranged as follows. A piece of glass tube, the sharp edges

mixed these solutions should produce a dark blue mixture in which no precipitate or flocculi are observable. Next, the naphtha is to be mixed with the spirit and the glycerine, and the remaining two ounces of the water added. This colourless fluid is lastly to be slowly mixed with the Prussian blue, the whole being well shaken in a large bottle during the admixture. The tincture of sesquichloride of iron is recommended because it can always be obtained of uniform strength. It is generally called the muriated tincture of iron, and may be purchased of any chemist.—" How to Work with the Microscope," p. 18.

* On the Anatomy of the Liver, illustrated with 66 photographs of the drawings, 1856.

of which had been removed, and one end a little enlarged in the blow-pipe flame, was inserted into the *portal vein*. The vessel was tied round the tube with strong thread, all chance of slipping being prevented by the dilated extremity of the tube. A piece about 4 inches in length was inserted into the *hepatic vein* in the same manner. The liver was placed in a dish, over the edge of which the tube inserted into the hepatic vein was allowed to project, in such a way that fluid flowing from it would be conveniently received in vessels placed beneath the stool upon which the dish was supported. A quantity of water at about the temperature of 100° Fahrenheit was placed in a vessel about 4 feet above the liver. The water from this reservoir was conducted to the portal vein by means of a glass syphon and India-rubber tube provided with a stop-cock. Before connecting the flexible tube with the portal vein, some of the water was allowed to flow freely through it, and permitted to gravitate into the vein in such a manner as to allow all the air contained in that vessel to rise to the orifice of the tube before the connection was rendered complete. It is very necessary to prevent air from being driven into the capillaries; for if this should happen, rupture of the vessels and extravasation of the fluid will inevitably occur. The liver having been kept warm by the application of cloths dipped in hot water, the stop-cock was turned so as to allow the water at 100° gradually to pass along the branches of the portal vein, and traverse the capillaries of the lobules. If such an arrangement be made we shall invariably notice that the entire organ soon swells to twice its size, while blood slowly trickles from the tube inserted into the hepatic vein. The blood soon becomes paler in consequence of its dilution with the water, the liver becomes tense, and the whole surface moist in consequence of the transudation of a little water; the small arteries are distended, the lymphatics are gorged, and the areolor tissue surrounding the vessels in the transverse fissure becomes puffy from the accumulation of water; bile passes along the duct, and the gall bladder becomes filled. Its contents may be forced out through the common duct by pressure. It soon becomes re-filled, and this process may be repeated many times, the fluid which is removed containing less bile each succeeding time.

The water was allowed thus to wash out the vessels of the liver, and to permeate the ducts, for about 4 hours, and the fluid collected from the hepatic vein amounted to 344 ounces. The last portions which passed through were perfectly colourless, and contained no traces of sugar, which substance had been

previously detected in considerable quantity. The liver was then removed, and injecting-pipes inserted into a branch of each of the following vessels distributed to different lobes:—*portal vein, hepatic vein, hepatic artery,* and *duct.* A pipe should also be inserted into the branch of *portal vein,* distributed to the lobe in which the duct is to be injected. While the vessels are thus distended with water branches are readily found, and the pipes can be inserted with ease. The liver was then wrapped up in soft cloths, small pieces of sponge being placed here and there, and subjected to considerable pressure during the next 24 hours, by being placed beneath a board loaded with about 15 pounds.

It is desirable only to attempt the injection of the liver during cold weather, otherwise decomposition may have commenced before the water has been sufficiently absorbed to permit the introduction of the injection into the vessels.

After the water has been absorbed, the liver is very much reduced in size, and almost of a clayey consistence. The vessels are now quite empty, and ready to receive any injection which the observer may desire to introduce. As before stated, I have tried various kinds of the ordinary opaque injections, but although these may be forced in very satisfactorily, it is absolutely impossible that the arrangements of the duct can be made out, while the smallest branches can hardly be distinguished under these circumstances, as a higher power is required for their demonstration than can be conveniently applied to the examination of an opaque injection. For these, and several other reasons, I have used transparent injections, and give the preference to the Prussian-blue solution, the composition of which is given in page 20.

Some of this injection was carefully forced into the several vessels, until the masses of liver were properly injected. It is desirable not to push the injection too far, as more is often to be learned from a partial injection than from one in which all the capillaries are completely filled.

We have, then, one lobe in which the *portal vein* is injected, another lobe injected from the *hepatic vein,* a third from the *artery,* and a fourth in which the injection has been forced into *the duct.* Of the three former, thin sections may be made after the lapse of a quarter of an hour, with a sharp, double-edged scalpel, or with Valentin's knife. These may be gently washed on both surfaces, and immersed in glycerine. After having been allowed to soak in this fluid for half an hour, or longer, they may be placed in a cell and subjected to examination.

Before, however, the arrangement of the duct can be made out, a further operation is necessary. The injection forced into the duct will pass to the smallest branches, through which it will be conducted to the cell-containing network of the lobule. It will run amongst the cells and distend the tubes of this network to such an extent that adjacent tubes will come into close contact, —the capillary, which intervenes between them, being empty, or nearly so. If a section were made, and examined, we should be able to make out nothing very definite; the duct could be traced into the lobule, and shown to be continuous with the injected portion, but the individual tubes could not be made out, or at least only one or two here and there could be demonstrated. It is obvious, that if the capillaries were injected after the duct, this difficulty would cease, and the individual tubes of the cell-containing network would be separated by an injected capillary vessel. The lobe in which the duct has been injected is therefore to be placed in water slightly warm, and the portal vein injected with perfectly clear parchment size. A pipe has already been inserted into this vessel. When the capillaries are quite filled, the pipe is closed with a cork, and the lobe placed in cold water until the size has completely set.* Thin sections may now be made in any direction, and as the lobe is very transparent, a small branch of the duct may often be followed for a very considerable distance. The sections should be preserved in glycerine. By comparing specimens from the different lobes which have been injected, the peculiar characters of each vessel will be readily made out. A rabbit's liver is very easily injected; but it is better to take one for each vessel, as the branches distributed to the different lobes are too small to receive the pipes.

After the pig's liver had been injected in the manner above-described, thin sections were examined in the microscope, and with the aid of the neutral-tint glass-reflector, their outline was traced upon transfer-paper in the manner described in page 7, and the lithographs in plates I, II, III, IV, obtained.

Plate I represents some small branches of the portal vein, just at the triangular space formed between three lobules. It will be observed, that small branches are given off from either side. These penetrate the fibrous capsules, and after reaching the interior of the lobules, gradually divide into the capillary network. The small trunks lie in the spaces between the lobules (interlobular spaces) in which also are found branches of

* For this purpose it is better to employ a mixture of size and glycerine.

the artery and duct with lymphatic vessels and nerves. These latter vessels are not to be distinguished in the present specimen because they are not injected, and being collapsed, exhibit a fibrous appearance, which, however, is exaggerated in the drawing.

PLATE II represents a branch of the hepatic or *intralobular* vein, which receives the capillaries converging towards it from the circumference of the lobule. The connexion of the small trunk with the capillaries may be contrasted with that of the portal vein. It will be noticed that the capillaries open at once into the vessel upon all sides, which is the reason why these small veins always give a perfectly circular opening upon transverse section. The meshes of the network are observed to be more elongated than those at the circumference of the lobules.

PLATE III shows the distribution of the arteries upon the surface of the lobules of the pig's liver. Small branches are seen in various situations, and some of these may be traced to the capillaries of the lobule into which they open, near its portal aspect, as was originally described by Kiernan, but subsequently denied by several observers.

In PLATE IV are represented different portions of the duct injected. Figs. 3 to 6 show the mode of ramification of the ducts upon the surface of the lobules. These drawings are only magnified 45 diameters.

Fig. 1 shows a few branches of a small duct, and a portion of the cell-containing network. At *a*, the small duct is seen to expand, as it were, to form the wide tube of the cell-containing network which is continued throughout the lobule, and in which the liver-cells lie. Several cells have been figured. The walls of these smallest ducts are composed of a delicate basement-membrane only, but the single layer of epithelium can sometimes be distinguished even in the injected specimens, as at *c*.

In the process of injection, the small ducts and the tubes of the cell-containing network into which injection happens to run, inevitably become distended to many times the diameter which they have in the natural state. By the distension of some of the small branches, the injection is prevented from entering others, so that even in a successful injection, we must not expect to find every branch of a small duct injected. The injection entering the cell-containing network at *a*, has accumulated there to some extent, and thus separated the cells from each other. Upon comparing this drawing with plate I, it will be observed that the tubes of the network are much too large to lie in the meshes of the portal capillaries; but this

arises merely from the undue distension to which they have been subjected. Although a good deal of injection has entered the tubes delineated in fig. 2, it will be found that this would adapt itself pretty well to the capillary network. Both drawings are magnified 130 diameters. If in the course of injection much force has been applied, this accumulation of the injection in the smallest ducts and most external portion of the cell-containing network, would take place to such an extent as to force adjacent tubes, into which injection has passed, into close contact; and thus a nearly uniform mass, in which no separate tubes can be seen, results. This confused appearance, however, can readily be distinguished from extravasation, and with a little practice, the observer will be able to obtain many demonstrative sections from a liver which has been injected successfully, exhibiting the characters above described. The best plan, however, of making preparations of this kind, is to inject the capillaries with plain size, in the manner described in page 24, after the duct has been injected.

LOBULES OF THE LIVER, OX.—PORTAL AND HEPATIC VEINS INJECTED.

PLATES V, VI.

THESE drawings illustrate the general arrangement of the lobules of the liver of the ox, which is very similar to that met with in most mammalian animals. The specimens were only partially injected. The dark parts of the drawing show the injected capillaries. The pale rough parts represent portions of the lobule, the capillaries of which are not injected.

PLATE V is a copy of a preparation in which the portal vein was injected with transparent blue injection, and plate VI represents a specimen in which the hepatic vein had been injected in a similar manner. Both sections were obtained with Valentin's knife, and have been preserved in glycerine. The examination was made by transmitted light, and the drawings were traced with the aid of the neutral-tint glass reflector.

The specimens are magnified fifteen diameters. In the first plate the lobules are seen to be imperfectly mapped out by the disposition of the capillaries injected from the portal vein,

but it will be observed that the lobules for the most part are not separated from each other by a distinct line of demarcation, as in the pig, but the capillary vessels of one imperfectly circumscribed space or lobule communicate pretty freely with those of the lobules immediately adjacent. The smaller branches of the vein lie in fissures between the lobules and give off branches on all sides. These *branches* never anastomose as some authors have described, but communicate with each other only through the intervention of capillary vessels. As may be seen by examining the plate, the capillaries of one lobule communicate with those of adjacent lobules; so that when the marginal capillaries of several lobules are only partially injected, we observe a number of rings enclosing clear spaces into the capillaries of which the injection has not extended.

The disposition of the hepatic vein in plate VI appears at first sight somewhat similar. I have had these plates arranged face to face in order that the comparison may be made more readily. Although it may be said generally that a small branch of the vein commences in the central part of each lobule and receives capillaries which converge towards it, the preparation shows that the capillaries which belong, as it were, to one branch, communicate here and there with those of adjacent branches, so that in an injected preparation an appearance not altogether unlike that represented in plate V, in which the portal vein is injected, is produced. It would be difficult in looking cursorily at these preparations to say in which the portal vein, and in which the hepatic vein, had been injected. In each case, spaces seem to be imperfectly mapped out by the disposition of the injected vessels. Upon more minute examination, however, the difference will be easily made out and it will be observed,—

First, that where the hepatic vein has been injected, the small trunk in the central part of the lobule in many instances has been cut across and remains open, because the capillaries are continuous with the vessel on all sides. The divided vein is shewn by a clear and almost circular opening, in consequence of the injection having escaped in preparing the specimen, plate VI *b*.

Secondly, fissures may be observed in the uninjected portions, some of them of considerable extent, *a*.

Thirdly, where the portal vein was injected, these fissures, plate V *a*, are bounded on either side by injected capillaries, and contain a small branch of the portal vein which also appears clear from the escape of injection. The divided hepatic vein is seen in the centre of the uninjected space, *b*. The two points upon which we may depend for ascertaining which is the centre

and which the circumference of the lobule are,—the circular opening of the divided hepatic vein which is always in the centre,—and the fissures in which lie branches of the portal vein, hepatic artery and duct, and which are situated in the intervals between the lobules. To see these points distinctly it is better to make a very thin section, wash it carefully, place it on a glass slide, and hold it up to the light. The question cannot always be determined by examining the liver in the ordinary manner. Since it has been shown to be so difficult to distinguish between the centre and circumference of the lobules in an injected preparation, it is not surprising that without great care mistakes should arise in examining uninjected specimens; and not unfrequently, the centre has been described as the circumference of the lobule, and the circumference as the centre; whence great confusion has occurred in making use of the terms *portal* and *hepatic venous congestion.* I propose to consider the subject of congestion of the lobules of the human liver in a separate paper.

Now from the intimate communication between the several small branches of the portal veins through the intervention of capillary vessels, it is possible that blood passing along a small branch of portal vein should reach the lobule and travel by a circuitous route through the portal capillaries of several lobules, before it is carried off by the hepatic vein; but when we consider that blood is poured into the capillaries upon all points of the circumference of the lobules such an arrangement would necessarily tend to cause a flow towards the centre of each lobule, and the blood would thus be carried off in the most direct manner. Supposing, however, obstruction to occur in certain branches of the vein distributed to the lobules; by reason of this arrangement the capillaries of these lobules would still be supplied with blood,—the functions of the secreting structure would still be carried on,—and the disorganization of the lobule effectually provided against.

This arrangement is one which favours the free distribution of the blood to the numerous minute elementary parts of which this solid organ may be said to be composed, while the circulation in each individual portion is rendered equable, and in case of any limited derangement in a particular lobule, an undue rush of blood towards the adjacent lobules is prevented.

The structure of the human liver in the respects above alluded to, is very similar to that of the ox.

CYSTS IN THE LIVER.

PLATES VII, VIII.

CYSTS are met with less frequently in the liver than in most other organs. Various theories with reference to the development of cysts have been propounded by different authorities, but no single view will account satisfactorily for the production of cysts in all cases, and it may be regarded as certain that cysts may be produced in several different ways.

CASE I.

Small Cysts in the Secreting Structure of the Lobule of the Liver. Obstruction of the common Duct, caused by the Growth of an Epithelial Structure at its Orifice.

The liver was taken from the body of a man, aged 53, who died in King's College Hospital. It was everywhere of a very dark yellow colour, and throughout every part of it the ducts were enormously dilated. When a section was made, the area of the divided ducts was seen to be many times larger than that of the branches of the portal vein. The small ducts in the interlobular fissures varied from three to eight or ten times their normal diameter. This great dilatation of the ducts was found to be caused by an obstruction situated close to the orifice of the common duct. Upon examination, a small eminence was discovered projecting from the surface of the mucous membrane. It presented to the unaided eye, the general characters of *encephaloid cancer*. Upon more careful examination, however, it was found to be composed of numerous plaits or lamellæ, covered on both their surfaces with columnar epithelium. This structure was very peculiar, and I had never seen anything like it before. Vessels were observed in the walls of the lamellæ, the contiguous surfaces of which were covered with epithelium. This mass had doubtless grown very gradually, and the dilatation of the ducts must have extended over a considerable period of time. The specimen was kindly sent to me by Dr. Budd.

Upon making thin sections in various parts of this liver, numerous very small cavities or spaces with sharp outlines were observed. When examined under a power of 20 diameters, the sections presented the appearances copied in fig. 3, plate VIII. The secreting structure was everywhere of a dark yellow colour. The tubes of the network seemed to have been stretched and compressed. The little spaces were of two kinds, —one evidently resulting from the division of a tube at right

angles,—the other clearly consisting of portions of small, round cavities. The former were proved to be small branches of the duct, much dilated, and thus served to mark the situation of the interlobular spaces. The latter were situated in the lobules themselves, and in some instances doubtless communicated with the ducts. They might be described as cavities, connected with the narrowest portions of the ducts, many of which, in the natural condition, commence below the surface of the lobule, or, in other words, become continuous with the cell-containing network after passing a short distance within the lobule.*

It seems to me, that these spaces have been formed thus.—The ducts have become dilated very gradually up to their narrowest portions in the interlobular fissures, where their walls consist of basement membrane alone,—and perhaps, in some instances this process may have extended to the tubes of the cell-containing network. In many situations these bulgings had proceeded to the extent of rupture, in which case the contents would have escaped amongst the meshes of the cell-containing and vascular networks. Under these circumstances, it is reasonable to conclude that the network immediately adjacent would have been stretched, much of it destroyed, and no doubt gradually removed by absorption; while here and there a tube might be considerably stretched, but not to such an extent as to be completely destroyed. If this were the case, we should expect to find, here and there, passing from one side of the cavity to another, narrow tubes filled with altered cells. In figs. 1 and 2, such tubes containing much yellow colouring matter, and oil globules, are represented. These drawings were carefully copied by myself, with the aid of the neutral-tint glass reflector, from preparations in my possession, which still show these points very distinctly. The appearances are to me very interesting, as they form additional evidence in favour of the existence of a network which contains the cells, distinct from the vascular network in which the blood circulates. I cannot account for the appearances observed in these preparations in any other manner. No cells at all resembling those of the healthy organ could be detected in this liver; but there was much granular matter, irregularly-shaped masses of colour-

* Some of the ducts are connected with the most superficial portion of the cell-containing network, but others plunge into the lobule, and after running for a short distance into the meshes of the cell-containing net-work, become continuous with some of the tubes in the lobule situated in its outer part, but nevertheless beneath the surface, and some distance from the interlobular fissures.—"On the Anatomy of the Liver, illustrated with 66 photographs of the drawings."

ing matter, and much coloured material in a very minute state of division.

Case II.

Cysts in the Liver of a Man aged 53, *associated with a similar condition of the Kidney.*

A liver weighing four pounds and six ounces, containing numerous cysts in every part, which varied in size from mere points up to the size of a pigeon's egg, was exhibited at the Pathological Society, in 1856, by my friend Dr. Bristowe, who kindly sent me a portion of this liver for examination.*

The liver was taken from the body of a shoemaker, aged 53, who was admitted into St. Thomas's Hospital in a very low and feeble state, and died two days afterwards. His health had been good till within ten weeks before his death, when he was attacked with severe pain in the epigastrium and right side, supposed to depend upon pleurisy. The urine became bloody five weeks after the commencement of his illness, and continued so up to the time of his death. Dr. Bristowe could only obtain this somewhat unsatisfactory history of the case. The kidneys were enormously enlarged, and also contained numerous cysts —"one kidney weighed two pounds seven ounces and a quarter, and the other two pounds and three-quarters of an ounce."

I did not obtain a portion of the liver until it had been removed from the body for some days, and I only attempted to ascertain the precise locality of the cysts, and, if possible, their mode of formation. The characters of the walls of the cysts, and their contents, have been fully described by Dr. Bristowe in his report. I injected a large branch of the duct with the Prussian-blue fluid†, and the portal vein with plain size. The portion of liver was then placed in cold water until the size had set perfectly. Thin sections were now made in different directions, with the aid of Valentin's knife,—soaked for some time in glycerine, and subjected to examination. In this manner thin sections of several cysts were obtained without difficulty.

The lining of the larger cysts was smooth, while that of the smaller ones was rough and irregular, and appeared to be formed by the tissue of the liver itself. Liver cells were here

* A description of the general characters of the cysts, of the condition of the liver, and of other organs, will be found in Dr. Bristowe's report, in the seventh volume of the "Transactions of the Pathological Society of London," p. 229. Dr. Wilks also describes a preparation in Guy's Hospital Museum of this very uncommon disease of the liver, in page 235 of the same volume.

† See p. 20.

and there observed in this situation, but for the most part the layer forming the immediate boundary of the cavity, when examined by a power of 130 was found to be granular, with a few scattered oil globules.

In some places, the blue injection had passed from the ducts into the cysts, but as the duct always lay on one side of the cyst, there could be no doubt that this resulted from rupture of the walls of the duct and intervening tissue, and extravasation into the interior. Although in many cases the larger cysts were close to the portal canals, the smallest were situated in the interior of the lobules, and in some instances nearer the centre than the circumference.

The injection had traversed the ducts satisfactorily. Their walls were even, and their calibre not greater than in health. (Plate VII, fig. 2 *e*; plate VIII, fig. 5). In no single specimen could I make out the slightest tendency to dilatation of their coats, and after the examination of very numerous specimens, I concluded that the theory which accounted for the formation of cysts by obstruction of the duct at a particular point, and the accumulation of secretion behind, must be rejected in this instance.

Upon carefully comparing many of the specimens together, it was observed that the cell-containing network of the lobule was much more lax in some situations than in others, the meshes in which the capillary vessels were situated were very wide, while the tubes of the network were narrow and seemed to have been much stretched.* In some places, the cell-containing network seemed to be reduced to a delicate fibrous web, the meshes of which were occupied with a clear fluid. These clear spaces were usually situated about midway between the centre of the lobule and its portal aspect. (Fig. 1, plate VII, *a*.)

In this case, then, the cysts appear to have originated in the meshes of the cell-containing network of the lobule. It is impossible to account for their origin; but we may suppose that in consequence of some morbid change in the parts, fluid was

* The *lobule* of the liver of vertebrate animals consists of two tubular networks, which are mutually adapted to each other. In one of these (capillaries) the blood circulates. In the other (cell-containing network) the liver-cells lie. At the circumference of the lobule, the *former* is continuous with the smallest branches of the portal vein, and receives blood from minute branches of the hepatic artery; the whole of this blood being carried away by a small branch of the hepatic vein situated in the centre of the lobule. The *latter* at the circumference of the lobule is continuous with the smallest ducts, while in the centre it forms a looped arrangement towards the hepatic vein. In the *first*, the blood flows from the circumference towards the centre. In the *second*, the bile escapes from the cells, and passes from the centre towards the circumference of the lobule, and is carried off by the duct.

effused between the capillaries and the cell-containing network, the latter becoming stretched, and its nutrition in consequence impaired. The fluid would increase in proportion until a small cavity with numerous altered tubes and attenuated capillaries was formed. The walls of this cavity were formed in the first instance merely by the hepatic tissue itself, but gradually, no doubt, material might be deposited which would become converted into a form of fibrous tissue, the internal surface of which would at length become invested with lining membrane covered by a delicate epithelial layer.

The drawings in plate VII illustrate the remarks just made. In fig. 1 the tubes of the cell-containing network are much narrower than those in fig. 2, which is taken from another part of the same liver where the cells present their ordinary characters, and exist in considerable number. In plate VIII, fig. 6, a small portion of the network, more highly magnified, is shown, in which the outline of the tubes is very distinctly seen.

At *a*, fig. 1, a very small cyst in process of formation is represented, and it will be observed that very few cells are visible; *b* is the margin of the lobule towards a small portal canal. In fig. 2, *c* is a small branch of the *intralobular* or hepatic vein, *d*, an interlobular space, and *e* a small gall-duct lying in the space.

One would be led to conclude from these observations that cysts in the liver may be formed in at least three ways:

1. By obstruction of a branch of a duct, and by accumulation of secretion behind the obstructed part.

2. By the gradual dilatation, caused by the obstruction of a large duct, extending backwards to the smallest ducts, even to the point where they become continuous with the cell-containing network of the lobule. The thin walls at length giving way, extravasation would take place amongst the vascular and cell-containing networks. Under these circumstances the duct would gradually become obliterated, while these little cavities might remain in the form of closed cysts.

3. By a gradual alteration occurring in a portion of the secreting structure within the lobule, leading to the deterioration of some of the meshes of the vascular and cell-containing networks, and the gradual pouring out of a serous fluid to occupy the place of the wasted structures.

There are other theories with reference to the mode of formation of cysts generally than those above alluded to, and it may be well just to advert cursorily to the most important of these.

Rokitansky considers that a cyst at the earliest stage of its

development really consists of a cell, which absorbs nutriment from the surrounding tissues, and gradually increases in size.

Bruch, on the other hand, holds that the contents of the cyst are first formed, being deposited in the substance of various organs and tissues, and that the wall of the cyst is formed around them.

In the second case reported the walls of the cyst were, no doubt, a secondary formation. It seems most probable that the first change which occurred was shrinking of the secreting structure of the liver, followed by effusion of serum to occupy the vacant space. Then further alteration of the cell-containing network, and gradually its complete disappearance in this situation. The ragged walls of the cavity afterwards became condensed, and were at length lined with an imperfect lining membrane.

ON THE ESTIMATION OF UREA, CHLORIDES, SULPHATES, PHOSPHATES, AND SUGAR IN URINE VOLUMETRICALLY.

BY MORITZ VON BOSE, PH. D.,
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*** In this paper weights are expressed in grammes and grains, and measures in cubic centimeters and grains; the grammes, gr., and cubic centimeters, C.C. being always placed before the grains, grs. Thus, ·01 gr. = ·154 grs. is to be dissolved in 1 C.C. = 15·44 grs. of water.

I HAVE been requested by Dr. Beale to write a short paper on the quantitative determination of certain constituents of the urine according to the volumetric method, for which purpose I have just now prepared in his laboratory some graduated solutions. I will first describe the plan itself, and then refer to the method of preparing the solutions.

The following is the principle upon which this method of analysis is based. As all chemical compounds are formed in certain definite proportions, and a specific quantity of a body requires for its precipitation a certain definite proportion of a reagent, we shall find the proportion of the unknown substance present, if we ascertain the quantity of the reagent required to neutralize it completely. Now the equivalent number represents the proportion in which bodies combine. To fulfil the

other condition it is only necessary to make a solution of the reagent of a certain definite strength, and pour it from a graduated glass, so that we may know the exact quantity we use. For instance, suppose the quantity of sulphuric acid (SO^3) in a solution is to be determined. We know that to precipitate 40 parts of sulphuric acid, exactly 122 parts of crystallized chloride of barium ($Ba\,Cl + 2HO$) are required,—or for 1 part of sulphuric acid, 3·05 parts of chloride of barium,—or for ·01 gramme = ·154 grain of sulphuric acid, ·0305 gr. = ·747 gr. of chloride of barium. Now if we dissolve 30·5 gr. = 471·04 gr. of chloride of barium in 1000 Cubic Centimeters of water = 15444 grs. or about 1¾ pint, every Cub. Cent. contains ·0305 gr. = ·47 grs. of chloride of barium; and if we place this solution in a tube graduated to *Cubic Centimeters* or *grains*, and allow it to flow gradually into a solution of sulphuric acid as long as we get a precipitate, the number of Cub. Cent. used indicates the quantity of *chloride of barium* employed, and from these data we at once ascertain the proportion of *sulphuric acid* contained in the solution.

The advantage of this method is evident.

First, it takes very little time to perform an analysis. Instead of precipitating, filtering, washing, drying, igniting, and weighing, the solution having been prepared, it is only necessary to notice how much is required to neutralize all the sulphuric acid present; and an analysis that formerly required days for its performance, is now finished in as many quarters of an hour.

Secondly, the performance itself is very simple, an acquaintance with complicated chemical operations is not necessary, and it may therefore be undertaken by those who are not skilled in the ordinary processes of chemical analysis.

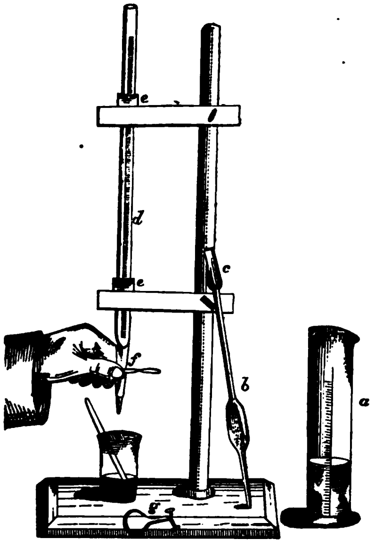
By this process it is quite practicable for physicians who have little time at their disposal, to determine very readily, and with accuracy, the quantities of those constituents of the urine which it is of importance to estimate in cases of disease.

APPARATUS REQUIRED.

1. *Burettes or graduated tubes,* fig. 1. *d.* It is convenient to be provided with one or more containing 50 Cub. Cents., and graduated to half Cub. Cents. The lower part of the tube is drawn to a small calibre, and to its extremity a small piece of glass tube about 2 inches long, is connected by a piece of India-rubber tube, *f,* so arranged that it can be compressed at pleasure by a wire-spring, as represented in the figure. When the two

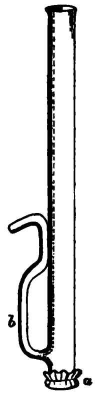
extremities of this spring are pressed by the finger and thumb, fluid will flow down the tube, and when the pressure is removed, the tube is rendered impervious. This little apparatus serves the part of a stop-cock, and possesses many advantages over the latter. Care must be taken to keep the tube perfectly clean, and the India-rubber should be removed and well washed after every analysis.

FIG. 1.



Apparatus required for the volumetric method of analysis. *a.* A glass jar capable of holding 500 C.C. graduated to five C.C. *b.* A pipette graduated to hold 20 C.C. *c.* A piece of India-rubber tube for the convenience of allowing the fluid to escape very slowly when pressure is applied by the finger and thumb. *d.* The burette capable of holding 50 C.C. and graduated to half C.C. The numbers are not marked on the tubes in the figure. *e.* Small pieces of wide India-rubber tube to hold the burette in its place. *f.* Small piece of India-rubber tube connecting the extremity of the burette with the spout, and capable of being compressed by the spring, the form of which is represented at *g*. The mode of using the apparatus is seen in the figure.

FIG. 2.



Dr. Beale's tube for filtering small quantities of the solution in order to see if the whole of the substance in solution has been precipitated. The small tube *b.* is curved as shown in the figure in order to prevent a drop of the unfiltered fluid from running down the outside as the filtered solution is poured through the spout. Rather less than one half the real size.

2. *Pipettes.*—The pipette is figured at *b* fig. 1. It is convenient to be furnished with one of 20 C.C. = 308·88 grs. capacity, one of 15 C.C. = 231·66 grs. and one of 10 C.C. = 154·44. grs.

3. *Cylindrical glass-measure,* graduated to 500 C.C.

4. The little apparatus represented in fig. 2 was constructed by Dr. Beale for the purpose of filtering a little of the fluid

from the deposit, in order to see if all the substance was precipitated. Filtering paper is tied round the lower extremity *a*. By plunging this beneath the fluid, the solution rises quite clear in the interior, and may be poured through the spout *b* into a small test-tube kept for the purpose.

In estimating the quantity of sugar, this will be found very convenient.

5. Beakers, stirring-rods, test-paper, funnels, and porcelain basins, with a tripod or small retort-stand, with a spirit-lamp or gas-lamp and small sand-bath, are also required.*

I must mention a few circumstances which it is important to observe in this method of analysis.

First, as to filling the burettes. The test-solution is poured in at the top till it is nearly full. A beaker is then placed beneath the orifice and a certain quantity of fluid allowed to flow from the tube until the upper surface reaches zero on the scale. The line on the burette should always correspond to the lowest part thick line at the top of the fluid, caused by the capillary attraction of the walls of the tube. Care must be taken that the part of the tube below the India-rubber joint is also quite full of fluid.

Secondly. With reference to the pipettes, it is convenient that they should be provided at their upper extremity with a short piece of India-rubber tube, *c* fig. 1, as by properly applied pressure of the finger and thumb upon this, the fluid may be allowed to escape very gradually.

The mode of proceeding in estimating the proportion of some of the constituents of the urine may now be described.

ESTIMATION OF UREA AND CHLORIDES.

The determination of the urea and chlorides is effected by solutions of pernitrate of mercury ($HgO.NO^5$). The principle of this method is, that *chlorine* gives a soluble, and *urea* an insoluble, compound with peroxide of mercury (HgO), and that chlorine has a greater affinity for mercury than urea has; therefore, if we add pernitrate of mercury ($HgO.NO^5$) to a solution containing chlorine and urea, the chlorine will first combine with the mercury, and we shall not get a precipitate of urea and mercury until all the chlorine has been saturated, and if we observe how much of the solution has been used before a precipitate occurred, we learn at once the quantity of chloride

* The apparatus referred to may be obtained of Mr. Griffin, Bunhill Row, who also supplies the test-solutions.

present; and the volume of the solution required for completing the precipitation, shews the proportion of urea, as will be explained presently. The same solution however is not used for both these determinations, as for convenience in reckoning it is better they should be of different strength. In both cases it is necessary in the first instance to remove the phosphates from the urine. In order to effect this we must prepare a mixture of 1 volume of a cold saturated solution of nitrate of baryta ($BaO.NO^5$) and 2 volumes of saturated baryta-water ($BaO.HO$). This we will call the *baryta-solution.*

1. Determination of Urea ($C_2H_4N_2O_2$).

Preparation of the Solution.—If pure mercury is procured, 71·48 gr. = 1103·93 grs. are dissolved in pure nitric acid with the aid of the heat of a sand-bath. When fumes of nitrous acid (NO^3) cease to be evolved and a drop of the solution gives no precipitate with chloride of sodium ($NaCl$), it may be evaporated on a water-bath in the beaker in which it has been prepared, to the consistence of a syrup. This, lastly, is diluted so as to obtain a volume of 1000 C.C. = 15444·00 grs. or about 1¾ pints, adding a few drops of nitric acid (NO^5) as often as the solution becomes turbid, which will render it clear again.

If the mercury of commerce is used a somewhat larger quantity of it is treated with nitric acid as before, but the process is stopped before it is completely dissolved: it is allowed to cool, when crystals of protonitrate of mercury ($Hg_2O.NO_5$) will form. The crystals are thrown on a filter and washed with a little nitric acid. They are to be boiled with nitric acid, till no more vapours of nitrous acid are given off, and no precipitate occurs, when a little is dropped into a solution of chloride of sodium. By evaporating a solution to the consistence of a syrup, pure pernitrate of mercury ($HgO.NO^5$) is obtained. This is diluted, but less water added than the solution will probably require. The proportion of mercury it contains is estimated either by sulphuretted hydrogen or potash; and lastly it is diluted, so as to contain ·772 gr. = 11·92 grs. of peroxide of mercury (HgO) in 10 C.C. = 154·40 grs.

1 C.C. = 15·44 grs. of this solution, made according to either of the above methods, indicates 0·01 gr. = 0·154 grs. of Urea.

Performance of the Analysis.—In the first place one takes 40 C.C. = 617·76 grs. of the urine and mixes them with

20 C.C. = 308·88 grs. of the baryta-solution: the precipitate is filtered and 15 C.C. = 231·66 grs. of the filtrate are placed in a small beaker. These 15 C.C. contain 10 C.C. of urine. The burette is next filled with the solution, which is added as long as the precipitate is observed to increase. Then the following test is to be applied to ascertain if a sufficient quantity has been added. A drop of the mixture is removed with a glass-rod and placed on a watch-glass. A drop of a solution of carbonate of soda ($NaO.CO^2$) is then placed near the first, and the two drops are allowed to flow together. If they give a white precipitate, the process is not yet finished, more of the mercury-solution must be added, and a drop tested as before, till the two drops when flowing together give a yellow precipitate, which shews an excess of mercury. A second experiment may be made to confirm the first, and lastly by reading the number of C.C. required, the quantity of urea contained in the urine is immediately ascertained. Still there is a correction to be made: the first drops of the solution which produced no precipitate did not combine with, and do not therefore shew the urea present. This volume must be deducted. For this purpose two cubic centimeters may always be subtracted from the volume of the test-solution used.

2.—Determination of Chloride of Sodium (NaCl).

Preparation of the Solution.—17·06 gr. = 263·47 grs. of pure mercury are dissolved as before described and the syrup diluted to a volume of 1000 C.C. = 15444·00 grs., or about 1¾ pints, as in the last case. Or the solution of pernitrate of mercury ($HgO.NO^5$), made from the impure mercury, which has been analyzed, is diluted in the proportion, that 10 C.C. of it may contain ·184 gr. = 2·84 grs. of peroxide of mercury (HgO).

1 C.C. of this solution answers to ·01 gr. = ·154 grs. of chloride of sodium.

Performance of the Analysis.—40 C.C. = 617·76 grs. of urine are mixed as before with 20 C.C. = 308·88 grs. of the *baryta-solution*; 15 C.C. = 231·66 of the filtered mixture are placed in a beaker and rendered acid by a few drops of nitric acid. The burette is filled with the test-solution, which is allowed to drop into the beaker, the mixture being continually stirred with a glass-rod. As soon as the precipitate at first formed, does not disappear by stirring, the operation is finished, and the volume of the solution required is read off. This shows the quantity of chloride of sodium contained in the urine.

With regard to removing the phosphates,—in both cases, it is to be remarked that if 1 part of the *baryta-solution* to 2 parts of the urine should not precipitate the whole (a point easily ascertained by adding some of the baryta-solution to a few drops of the filtered mixture), more of the baryta-solution must be added. This then would somewhat modify the quantity of the mixture to be taken for the test. Suppose it is desired that it should still contain 10 C.C.=154·44 *grs.* of urine in it. 17½ C.C.=270·27 *grs.* of the mixture would be required, if there are 3 parts of baryta-solution to 4 parts of urine; 20 C.C.=308·88 *grs.* would be taken, if there are equal parts of baryta-solution and urine. More than this will hardly ever be required.

3.—Determination of the Sulphuric Acid.

Preparation of the Solution.—A quantity of crystallized chloride of barium is to be powdered, and dried between folds of blotting-paper. Of this, 30·5 *gr.* = 471·10 grs. are to be dissolved in 1000 C.C.=15444·00 of distilled water.

A dilute solution of *Sulphate of Soda* is also required.

Performance of the Analysis.—100 C.C.=1544·4 *grs.* of the urine are poured into a beaker, a little hydrochloric acid added, and the whole placed on a small sand-bath, to which heat is then applied. When the solution boils, the chloride of barium test is allowed to flow in very gradually as long as the precipitate is seen to increase distinctly. The heat is removed, and the vessel allowed to stand still, so that the precipitate may subside. Another drop or two is then added, and so on, until the whole of the SO^3 is precipitated. Much time however is saved by using the little apparatus represented in fig. 2. A little of the fluid is thus filtered clear, poured into a test-tube and tested with a drop from the burette; this is afterwards returned to the beaker, and more of the test-solution added if necessary. The operation is repeated until the precipitation is complete. In order to be sure that too much of the baryta solution has not been added, a drop of the clear fluid is added to the sulphate of soda placed in a test tube. If no precipitate occurs more *chloride of barium* must be added; if a slight cloudiness takes place, the analysis is finished, but if much precipitate is produced, too large a quantity of the test has been used, and the analysis must be repeated.

For instance, suppose 27 half-cubic centimetres=208·49*grs.*, have been added, and there is still a slight cloudiness produced, which no longer appears after the addition of another half-cubic

centimetre = 7·722 *grs.* of the solution, we know that between 27 and 28 half-cubic centimetres are required to precipitate the whole of the sulphuric acid present, and 100 C. C. = 15444·00 of urine contain between ·135 and ·14 gr. = 2·085 and 2·162 *grs.* of *sulphuric acid.*

4. Determination of the Sugar.

This method is deduced from the reaction occurring in employing Trommer's test for grape-sugar. It is well known that grape, or diabetic sugar, possesses the power of reducing the oxide of copper to the state of yellowish-red suboxide.

Preparation of the Solution.—An alkaline solution of sulphate of copper is prepared with the aid of *tartaric acid* and *potash.* The former prevents the precipitation of the oxide of copper by the potash. 40 gr. = 617·76 *grs.* of cyrstallized sulphate of copper are dissolved in about 160 C.C. = 2471·04 of water. Next 160 gr. = 2471·04 *grs.* of neutral tartrate of potash are to be dissolved in a little water, and from 600 to 700 gr., about 9500 *grs.* of a solution of soda of 1·12 sp. gr. are to be mixed with it. The solution of the sulphate of copper is added gradually, and the whole diluted with water to a volume of 1154·4 C C. = 17828·5 *grs.*; 10 C.C. = 154·4 *grs.* of this solution correspond to ·05 gr. = 772 *grs.* of sugar.

Performance of the Analysis.—10 C.C. = 154·4 grs. of the copper solution are diluted with 40 C.C. = 617·7 grs. of water and placed in a porcelain dish. About 20 C.C. = 308·8 *grs.* of the urine are diluted with from 10 to 20 times its bulk of water, so as to produce, for instance, 300 C.C. = 4633·2 grs. This is to be poured into the burette and adjusted so as to fill it to the 0° of the scale. The dish with the copper solution is arranged on a sand-bath placed on a tripod stand, at a convenient distance beneath the orifice of the burette. A spirit or gas-lamp is applied until the copper solution approaches the boiling point, when the urine is allowed to flow in gradually, until suboxide of copper ceases to be precipitated, and the solution no longer possesses a blue colour. This is ascertained by removing the lamp and allowing the deposit to settle, when the blue tinge may be observed if the whole has not been precipitated by tilting the basin a little and observing the colour of the clear fluid as it flows against the white porcelain. Dr. Beale's little filtering apparatus will also be found of value in this operation, and its employment will save time. If the solution has still a blue tinge more urine is to be added, and the mixture again boiled for a minute. This operation is to be

repeated as long as any unreduced oxide remains in solution. When the process is finished the proportion of sugar contained in the urine is easily calculated.

Suppose 24 C.C. = 370·6 *grs.* of the diluted urine have been required to reduce the 10 C.C. = 154·4 *grs.* of the copper solution, these 24 C.C. contain ·05 gr. = ·772 *grs.* of sugar. But since 300 C.C. of the dilute solution contain only 20 C.C. = 308·8 grs. of the urine, the 24 C.C. contain only 1·6 C.C. = 24·7 *grs.* Therefore 1·6 C.C. = 24·7 *grs.* of urine contain ·05 gr. = 0·772 *grs.* of sugar, or in 100 C.C. = 1544·4 grs. of urine 3·12 gr. = 48·18 *grs.* of sugar are present.

(To be continued.)

CHEMICAL AND MICROSCOPICAL EXAMINATION OF MORBID SPECIMENS.

CHOLESTEATOMA.

TUMORS of this description are very rarely met with. Their anatomical characters were first described by J. Müller. Those referred to by him and later authors were in connexion with the brain and its membranes, and the two cases brought forward in this communication, are the only instances of true cholesteatomatous tumors occurring in other parts of the organism which I can find recorded.

CASE I.

Contents of a large Tumor situated over the Trochanter-major of a Woman. Removed by Mr. Simon.

The tumor had been growing about fifteen years, and had attained a large size. Mr. Simon made an incision into the tumor and squeezed out the contents, which he sent to me for examination.

The portion examined consisted of a dirty brown, soft, pulpy mass, with a strong odour, closely resembling that of fæces. Interspersed through it were numerous thick micaceous plates, like fish-scales, but thicker. These plates were very easily separated into a number of thinner scales. In its general appear-

ance, the mass much resembled the residue at the bottom of anchovy bottles.

The capsule presented the usual characters of such structures, being composed principally of white fibrous tissue, with vessels.

Chemical Composition.—151·29 grs. of the pulpy mass were examined, and the per-centage composition was as follows:—

		In 100 parts of solid matter.
Water	87·78	
Solid matter	12·22	
Extractive soluble in water and alcohol	3·119	25·52
Extractive soluble in water only	1·030	8·44
Fixed alkaline salts, consisting of sulphates, chlorides, phosphates, carbonates, with a trace of iron.	·396	3·24
Fatty matter	·053	·43
Albuminous matter insoluble in boiling water	6·999	57·27
Earthy salts, consisting of phosphate and sulphate of lime	·608	4·97

The extractive matter soluble in alcohol, had the same peculiar smell as the mass itself. The odorous material was volatile, and was present in the fluid which passed over in distillation in considerable quantity. The fatty matter was treated with alcohol, but no cholesterine crystallized out, probably in consequence of being protected from its action by the hard fat present. The total quantity of fatty matter was so small that no further experiments could be resorted to. It should be borne in mind, that an amount of cholesterine which when examined in the microscope would be accounted considerable, is often so small as not to be appreciable by the balance.

The pearly scales were carefully separated from the remainder of the mass, and well washed in water. They were scarcely altered by the action of several chemical reagents with which they were treated.

1. Boiling water exerted no change.

2. Alcohol dissolved out a very small quantity of matter, consisting principally of cholesterine.

3. Ether extracted a trace of very hard fat.

4. The vesicles of which the flakes were composed shrunk a little when acted upon by boiling liquor-potassæ, and a few oil globules were developed upon their surface.

5. When boiled with acetic acid, they became more transparent, and the outline more delicate; at the same time, a few dark spots made their appearance round the margin of the vesicles.

6. No change was produced by the action of strong nitric or hydrochloric acids.

7. Some of the scales were left for months in a little water, and although all the other constituents of the mass putrefied, these underwent no change.*

Microscopical Examination.—The mass consisted of two portions which may be described separately. 1. Dark brown pulpy matter, which appeared amorphous when examined with low powers. 2. The pearly scales above-alluded to, resembling fish-scales when examined by the unaided eye.

1. *The brown pulp* was found to consist of numerous crystals of cholesterine (*c*, fig. 3), scaly particles, probably cholesterine imperfectly crystallized, free oil globules, a few cells with dark granular contents, free granular matter, a few blood-corpuscles, and many of the separated vesicles described below.

Fig. 3.

1000ths × 215

Cholesteatoma.—*a*. Large cells, of which the laminæ forming the pearly scales were composed. Some of these are shrivelled and flattened, resembling the superficial scales of the epidermis. *b*. Fibrous tissue from the inner surface of the capsule. *c*. Crystals of cholesterine. Oil globules and granular matter are seen in various parts of the field.

2. *The scale-like plates* were easily separated into very thin laminæ, which were found to be composed of perfectly clear, transparent vesicles, most of which had assumed a polyhedral form packed together, after the fashion of the vesicles, of adipose tissue. The refractive power of the vesicles was not great. The separated vesicles were ovate, and were larger at one extremity than the other. With very few exceptions they were perfectly clear, and their walls apparently structureless (fig. 3 *a*). A few of them were slightly granular, particularly at the larger end. Some of them were much altered in form, and approached in character the more superficial flattened cells of the epidermis.

* A year and a half after these scales had been placed in water, they were found to present the same characters as when recently obtained.

Case II.

Cholesteatomatous Tumor on the Buttock.

Another specimen of a cholesteatomatous tumor was sent me about a year ago, by my friend, Dr. May, of Reading. The patient was a lady about 55 years of age, very stout and plethoric. The tumor was about the size of an egg, situated in the fold of the buttock of the left side. It was in the subcutaneous fat, and did not involve the fascia. About half of it protruded. The tumor had existed 16 years, but latterly it had increased in size, becoming painful from congestion, and causing inconvenience when the patient sat down. Its removal was followed by erysipelas, which unfortunately proved fatal.

The microscopical characters of the tumor were precisely similar to those of the last case. Small plates of cholesterine were very abundant, and many of the peculiar transparent vesicles, similar to those described, were observed.

These tumors are exceedingly rare. They are more frequently met with about the base of the brain than in other situations; and it is curious that several of the cases in which they have occurred were lunatics.

J. Müller first described this form of tumor, and alludes to the pearly lustre of the scales, and their polygonal, transparent epidermis-like aspect. The tumor which he describes, perforated the dura-mater and occipital bone.

Dr. Gull describes one which was situated at the base of the brain of a lunatic in Colney Hatch Asylum, so as to compress the medulla and pons.

Another case is described by Dr. Thurnam, and reported upon by Dr. Bristowe, in the fifth volume of the "Transactions of the Pathological Society of London." This was situated on the upper surface of the medulla oblongata, and appeared to have been developed in the convolutions under the edge of the right lobe of the cerebellum. The patient was a woman aged 60, a lunatic in the Wilts County Lunatic Asylum.

Dr. Wedl gives a figure of a cholesteatoma connected with a cystic sarcoma of the breast.

Cruveilhier, Rokitansky, Virchow, Lepestre, and others, describe similar tumors in connexion with the brain or its membranes.

I have not met with reports of cases of these tumors occurring in the parts of the body in which those described in this communication were situated.

ANALYSIS OF SOFTENED CEREBRAL MATTER SURROUNDING AN APOPLECTIC CLOT IN THE LEFT HEMISPHERE OF A WOMAN, OF THE CLOT ITSELF, AND HEALTHY PORTION OF THE BRAIN.

THE patient, who was under the care of Dr. Todd, in King's College Hospital, was an unmarried, nervous woman, aged 40, a schoolmistress, of a dark complexion, with grey eyes and grey hair. She had always been temperate, had lived well, but of late had suffered much anxiety with reference to money matters. Her health had always been good.

Three months before her admission, she fell down suddenly in a fit, but soon recovered. Shortly afterwards she again fell down by the road-side, and lost her senses, but how long she remained unconscious she could not tell. She gradually recovered the use of her limbs after this second attack, but her power of speech and memory were slightly impaired. She was now affected with slight twitches and spasms of the muscles of the left arm. Her memory, especially for recent events, became impaired, and she had the greatest difficulty of expressing her ideas in words.

At the time of her admission she spoke very deliberately, and had to consider a long while before she could answer a simple question. Her answers were sometimes quite irrelevant, and generally in monosyllables. Her pulse was 88. There was no paralysis, and the sphincters acted naturally. She remained about a fortnight in this condition. On the morning of April the 11th, a sudden attack of diarrhœa came on. About 1 p.m., she was attacked with convulsive movement of the limbs. The convulsions lasted only a few minutes. Soon afterwards she sank into a state of coma. At 6 P.M., the legs were suddenly drawn up, and convulsive twitchings occurred in the muscles of the arms. There was no distortion of the countenance. At 10 P.M., the breathing was stertorous, and the coma profound. The muscles were relaxed, and there was no reflex action in the extremities. The right pupil was smaller than the left, but neither contracted under the influence of a strong light. Irritation of the conjunctiva, however, caused contraction of the orbicularis. Death took place after the coma had lasted twenty-eight hours.

Post-mortem, 36 hours after death.

Head.—Membranes healthy—veins of dura mater turgid with blood—no increased subarachnoid effusion—surface of convolutions much flattened—whole brain appearing too large for its case, as if forced out at the surface by the increase of some structure within.

In the central part of the left hemisphere, about three-quarters of an inch below the convex surface, was a hard mass about the size of a hen's egg, which had a fibrous appearance at its circumference resembling hardened fibrine, but was soft in the central part in consequence of the presence of recently effused blood. The tumor itself probably consisted originally of a clot which had become altered by subsequent changes. The central matter surrounding the tumor was soft and pulpy, and was broken down by the slightest touch, while the consistence of the white matter of the hemisphere generally, was even firmer than usual. The lateral ventricles contained about an ounce of fluid. The corpora striata and optic thalami appeared healthy.

Heart much dilated—considerable thickening of mitral valve, with slight deposit upon the aortic valves about the corpora Arantii.

Liver apparently healthy—vessels of *kidneys* distended with blood.

The white matter of the hemisphere, apparently in a healthy state, the softened cerebral matter immediately surrounding the altered clot, and the clot itself, were submitted to analysis.

1. White matter of the hemisphere.
2. Softened cerebral matter surrounding the clot.
3. The altered clot.

	1	2	3
Water	71·4	81·49	85·62
Solid matter	28·6	18·51	14·38
Extractive matter	1·16	·93	1·75
Fat soluble in boiling alcohol	8·52	5·49	·49
Fat soluble in ether only	2·77	1·65	
Soluble salts	*·69	†1·03	‡·96
Earthy salts	·37	·52	·17
Vessels, cells, albumen, &c.	15·09	8·89	11·01

For the purpose of comparing the results, the proportion of the different substances in 100 grains of solid matter has been calculated, and the results are shown in the following table:—

	1	2	3
Solid matter....	100·00	100·00	100·00
Extractive matter	4·05	5·02	12·16
Fat soluble in boiling alcohol	29·79	29·65	3·40
Fat soluble in ether only	9·68	8·91	
Alkaline salts, soluble in water	2·41	5·56	6·67
Earthy salts, insoluble in water	1·29	2·80	1·18
Vessels, cells, albumen, &c.	52·76	48·02	76·56

In the softened portion an increase of water is to be noticed,

* The ash was very alkaline, containing alkaline, phosphate, sulphate, and chloride. † Consisting of phosphate, sulphate, and chloride.

‡ Containing phosphate and chloride, and much sulphate.

while the relative proportion of fatty matter remains unchanged. Both the alkaline and earthy salts are increased, absolutely as well as relatively. The substances insoluble in water are diminished.

CASE OF RAPE IN WHICH SPERMATOZOA WERE DETECTED IN THE MUCUS REMOVED FROM THE VAGINA.

A LITTLE girl was brought into King's College Hospital in July 1857, upon whom it was said a rape had been committed about three hours before. My friend Mr. C. Heath, house-surgeon, removed with a pipette a little of the mucus from the vagina at a point beyond the hymen, and after placing it upon a glass slide, sent it to me for examination. It was not examined until 6 hours afterwards, and being uncovered was quite dry. Nothing definite could be made out by submitting the dry mass to examination. It was therefore moistened with a drop of distilled water, covered with a piece of thin glass, and examined with a quarter. Numerous cells of vaginal epithelium were seen, and amongst them as many as 6 spermatozoa were discovered in various parts of the fluid. All these were well defined and free from the epithelium, but many others less perfect, the tails being broken or removed, were found amongst the vaginal epithelium.

A careful drawing of these was made under the quarter of an inch object-glass (215 diameters) and lithographed.*

Spermatozoa may be dried on a glass-slide and although kept for some time, when moistened with distilled water may be identified with certainty. They may be preserved as permanent objects in some preservative solution, such as naphtha and creosote, weak spirit, or glycerine. The latter fluid refracts the light rather too highly to see them very distinctly. The specimen above described has been preserved in solution of naphtha and creosote,† and the character of the spermatozoa are well seen.

EXAMINATION OF RAGGED FIBRIN-LIKE MASSES FOUNDIN THE SPUTUM OF AN OBSCURE CASE OF SOLIDIFICATION OF THE RIGHT LUNG.

THE following notes of the case were furnished by my friend Mr. Edward Ray of Dulwich, who sent me the specimen for examination.

"J. R. W., aged 62, a gentleman who had been in the Bank of England upwards of 40 years, came under my care

* "The Use of the Microscope in Clinical Medicine," No. II. "Urinary Deposits." † "How to Work with the Microscope," page 36.

after his return from Ramsgate (where he had been staying about 4 months) on the 6th of November, 1856. He was of full habit (but had latterly lost weight), had enjoyed perfect health to about July 1855, and there was no history of phthisis or malignant disease in his family. His illness commenced with cough and spitting of blood, but his malady gave him no uneasiness until October of the same year, when the symptoms became more persistent, and since this period they have steadily increased, and for some months past have prevented his attention to business.

He complains now only of cough and hurried breathing, which are most troublesome at night or when in recumbent position. He sits up, and prefers his easy chair and the erect position to reclining in bed. He looks anxious, but complains of no pain. Respiration 30. Pulse 124, without much power. Skin cool. Tongue but slightly coated. Urine freely secreted. Appetite good. Bowels acting daily and excretions normal. Expectoration copious, consisting of a viscid mucus (containing pus globules with large epithelial scales) *occasionally* tinged with, or containing here and there, a florid streak of blood.

On examining the chest, the right side was flatter than the left, but there was some fulness above the right clavicle more marked during inspiration.

Anteriorly the whole of right side was dull on percussion. The left side resonant excepting the cardiac region.

Posteriorly.—The right side was also dull on percussion, excepting over the inner and inferior portion of right lung. The left side was perfectly resonant.

Anteriorly.—On the right side only tubular breathing could be heard most marked under the clavicle, where bronchophony was present.

Posteriorly.—The respiratory sound was normal only over a *small portion* of the inner and inferior part of the right lung. Tubular breathing only could be heard elsewhere, with occasional moist sounds. On the left side respiratory sounds were puerile.

The heart's sounds were normal, but the heart's action was more frequent than natural.

About the 14th of Nov., 1856, he expectorated a portion of solid matter, looking like a fragment of fibrinous matter.*

The patient somewhat rapidly lost power, the respirations increased to 40 and 48 in a minute. Enlarged glands could be felt above the right clavicle. Breathing in the left lung became oppressed. The patient could not sleep. The respiratory movements were impeded. The legs became œdematous, and he died on the 12th of December, 1856.

* This was submitted to microscopical examination.

A *post-mortem* examination could not be obtained.

Dr. R. Bright saw this case early and up to July 1856 with Mr. Wheeler, and once with me in November; the case had always been an obscure one. On one occasion some quantity of pus had been expectorated, as if from abscess.

The morbid sounds were confined to the apex of the right lung up to July 1856. Mr. Wheeler had had some solid portions, which were expectorated, examined; they were thought to be malignant.

Dr. Roots and Mr. Barry saw the patient at Ramsgate. Dr. Roots considered it to be a case of chronic inflammation of the lung. Mr. Barry regarded it as a case of tubercular disease.

When I first saw the case I looked upon it as one of consolidation of the lung after pneumonia; but the peculiar and occasionally coloured sputum with the expectorated solid matter led me soon to suspect malignant disease.

After several careful examinations of the masses expectorated in this case, I still feel doubtful as to the nature of the morbid change to which the solidification was due. One mass examined was about an inch in length and half an inch thick. Upon making a thin section and tearing it up carefully with needles, the substance was seen to be composed of a dense network of tubes of considerable size (about the 1-500th of an inch in diameter), the spaces between were occupied by a number of very minute granular cells, for the most part spherical, or nearly so, with an indistinctly fibrous material. There were also a few larger cells containing oil-globules. The tubes were for the most part filled with granular matter and oil-globules. Few would have allowed blood corpuscles to pass through them. The general appearance of the structure is represented in fig. 1, plate IX, and in fig. 2, a vessel evidently pervious, and containing a few blood-corpuscles, is represented. Fig. 1 is magnified 130, and fig. 2, 215 diameters.

It seems to me that these tubes were altered pulmonary capillaries. No yellow elastic tissue could be found, but it is possible that this may have degenerated. Coagulable material had been gradually deposited within the vessel until its tube had become completely obliterated. Portions having undergone these changes probably became detached from the adjacent tissue, still containing pervious vessels, and were removed from time to time in the expectoration. The little granular cells presented the general characters of those found in many exudations.

It is difficult to form an opinion of the nature of the case from these data alone, in the absence of a *post-mortem* examination, but it seems not improbable that it may have been one of tubercular infiltration, which had undergone softening in some places.

EXAMINATION OF A LARGE TUMOR CONNECTED WITH THE THYROID OF A WOMAN, AGED 54.

THE portion of the tumor was sent to me by my friend Dr. Eade. The case occurred in the practice of Messrs. Gibson and Bateman, who kindly furnished the particulars given below.

The swelling had existed for five or six years, and the patient had consulted several surgeons of eminence in London and Edinburgh, but great difference of opinion existed as to its nature. In November 1856, it had much increased in size, and the patient sought the advice of a surgeon in her own town. An exploratory incision was made, but after careful examination it was not considered advisable to attempt the removal of the tumor, but to endeavour to diminish its size by keeping up a constant discharge. This plan succeeded well, and by the middle of January the tumor had decreased to half its original size. Sometime afterwards, however, obstinate vomiting came on and ultimately proved fatal. The patient had been a teatotaller for years, and although her powers had been much reduced, she could not be prevailed upon to take the necessary amount of nutriment and stimulants.

A post-mortem examination was made. The organs of the body generally seemed healthy, and no trace of cancer or any other morbid growth could be detected in any tissue.

A thin section of the portion of tumor sent for examination was made with the double-edged knife, and after having been torn a little with needles was examined with a quarter of an inch object-glass. It was found to consist principally of a coarse form of white fibrous tissue in which small spaces of an elongated form were found here and there. These spaces were occupied by a collection of small granular cells.

In pl. IX, fig. 3, the characters of this tumor are represented.

The growth, although intimately connected with the thyroid, was clearly not the altered gland itself, but a distinct structure originating probably in the fibrous tissue and not in the proper structure of the gland. In cases of enlargement of the thyroid body the structure very closely resembles that of the healthy organ; the closed cavities of the gland are often very large, and contain a firm and perfectly transparent material, or viscid serum,—characters totally distinct from those observed in the examination of this tumor, which probably should be regarded as a rare variety of fibrous tumor.

TUMOR CONNECTED WITH THE LEFT CORPUS STRIATUM IN A MAN, AGED 20.

FOR the following particulars of the case I am indebted to Mr. Rae, of Greenwich Hospital.

N. M. aged 20, while in the West Indies in 1855, was attacked with headache and dimness of vision affecting both eyes. He attributes these symptoms to cold. When admitted into Greenwich Hospital, on the 31st of August 1856, he could only distinguish light from darkness. The pain soon extended along the spinal column. There was a general diminution of voluntary motion. The urine was not expelled from the bladder, the sphincter ani became relaxed and the power of deglutition was much impaired. The patient died from an attack of pneumonia on December 31st.

Post-mortem.—A tumor about two inches in diameter and two-thirds of an inch in thickness, with a nodulated surface, was discovered upon the surface of the corpus striatum of the left side, with which it was intimately connected. It extended through the septum lucidum and partially covered the right corpus striatum. Connected with each lateral ventricle was a cyst filled with yellow serum. That on the left side completely filled up the anterior cornu.

The tumor resembled the corpus striatum in colour and general appearance, and might be said to be an outgrowth from it. Upon section numerous small and separate clots were seen in different parts.

The structure of this tumor is represented in plate IX, fig. 4. The tumor appeared to be composed almost entirely of caudate nerve vesicles. Besides these large cells were a number of small granular corpuscles, a few of which are seen in the upper part of the figure. The capillary vessels were numerous but no nerve fibres could be detected. In the intervals between the nodular markings upon the surface and extending for some distance into the interior there was a considerable quantity of areolar tissue consisting principally of very many fibres of the yellow element as represented in fig. 5. In the upper part of fig. 4 is seen a capillary vessel. It is interesting to notice that this tumor, which certainly would have been termed a malignant growth if it had been examined by the unaided eye only, consisted principally of cells very closely resembling those of the corpus striatum itself, with which structure it was immediately continuous.

EXPLANATION OF THE PLATES.

The scales at the bottom of each plate represent hundredths or thousandths of an inch magnified in the same degree as the object delineated.

PLATES I, II, III, and IV, were taken from different parts of the same liver. The manner in which they were prepared is described in page 21.

PLATE I.

Portions of three adjacent Lobules of the Liver of the Pig, in which the capillaries of the portal vein have been injected. The interlobular fissures are also seen with the small branches of the portal vein. The duct and artery are not represented, as they have not been injected. The fibrous appearance caused by these vessels not being distended with injection, and by the presence of a little fibrous tissue is too coarsely indicated in the drawing. In the natural state of the parts the meshes of the capillary network are occupied by the cell-containing network, but the cells are not represented in the plate for the purpose of avoiding confusion.

PLATE II.

Small Intralobular Branch of the Hepatic Vein in a small Lobule of the Pig's Liver.—The curved line shows the boundary of the lobule. Capillaries are observed to open into the small trunk in every part of its course, while in the case of the portal vein, small branches are given off from the interlobular branches at intervals, and penetrate the capsule to enter the lobule, as represented in plate I.

PLATE III.

Branches of the Artery on the Surface of the Pig's Liver, injected.—By the communications between these vessels at various points, an arterial network is formed. Many small

Fig. 3. *Portion of Tumor removed from the Neck.*—The fibres are too coarsely represented in the drawing, page 51.

Fig. 4. *Tumor Connected with the Corpus Striatum,* consisting almost entirely of the ganglion cells, represented in the drawing. At the upper part of the figure is seen a small vessel with some fibres of yellow elastic tissue.

Fig. 5. Fibres of yellow elastic tissue abundant in some parts of the tumor.

Plate X.

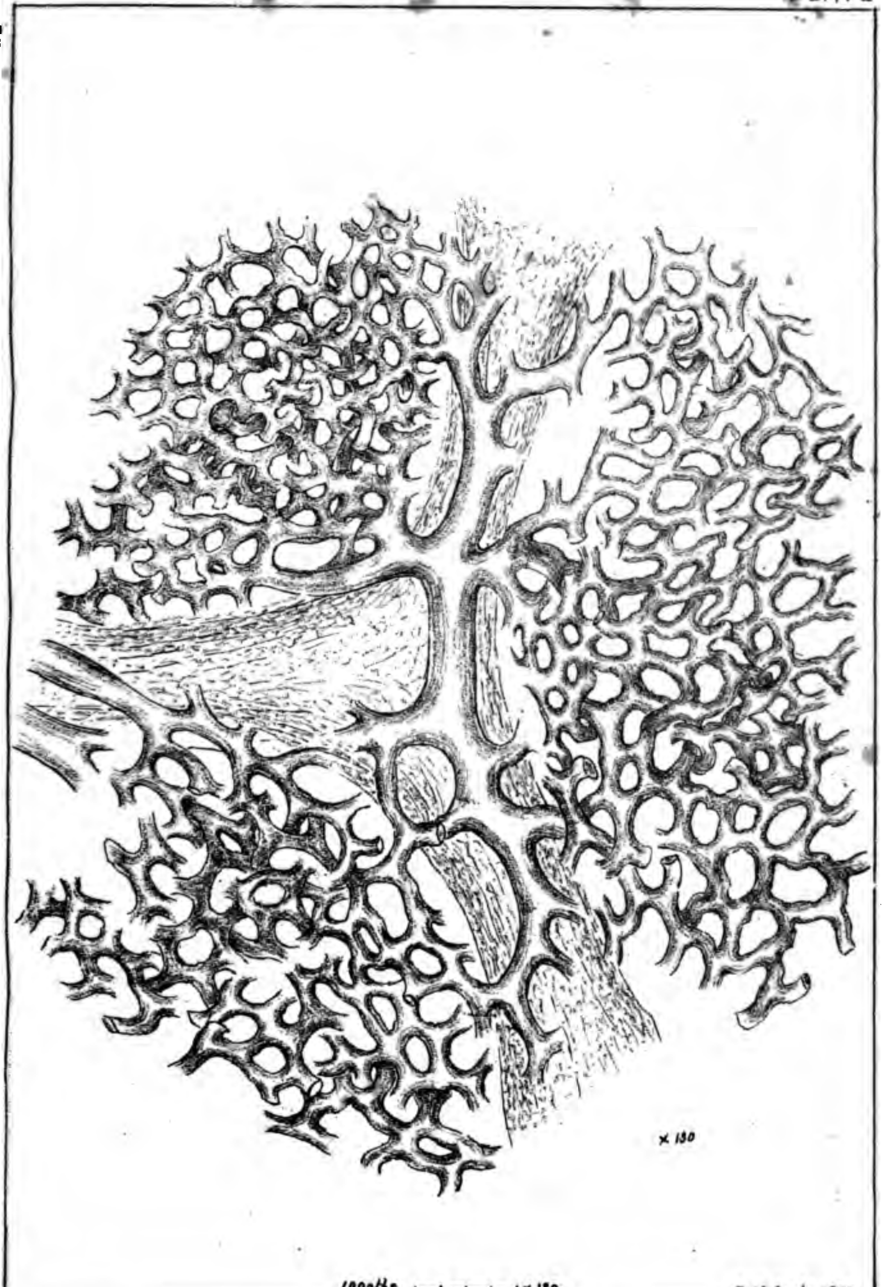
Large Bile-Ducts of a Squirrel injected.—The small figure represents the same of the natural size, with a section of the gall-bladder. The position of the two figures is reversed, but the letters refer to the same parts in both drawings.

a. Common duct.
b. Cystic duct.
c. Left hepatic duct.
d. Right hepatic duct.

It will be observed, that the duct *b* opens directly into the common duct, while the duct *c* joins the cystic duct at a point above this. Between the two last is observed an intimate plexus of smaller ducts through which they communicate very freely with each other. This plexus also receives small trunks from the lower surface of the liver. All the hepatic ducts and the cystic duct contain in their coats numerous little cavities or sacculi, while the coats of the common duct are almost entirely free from them.

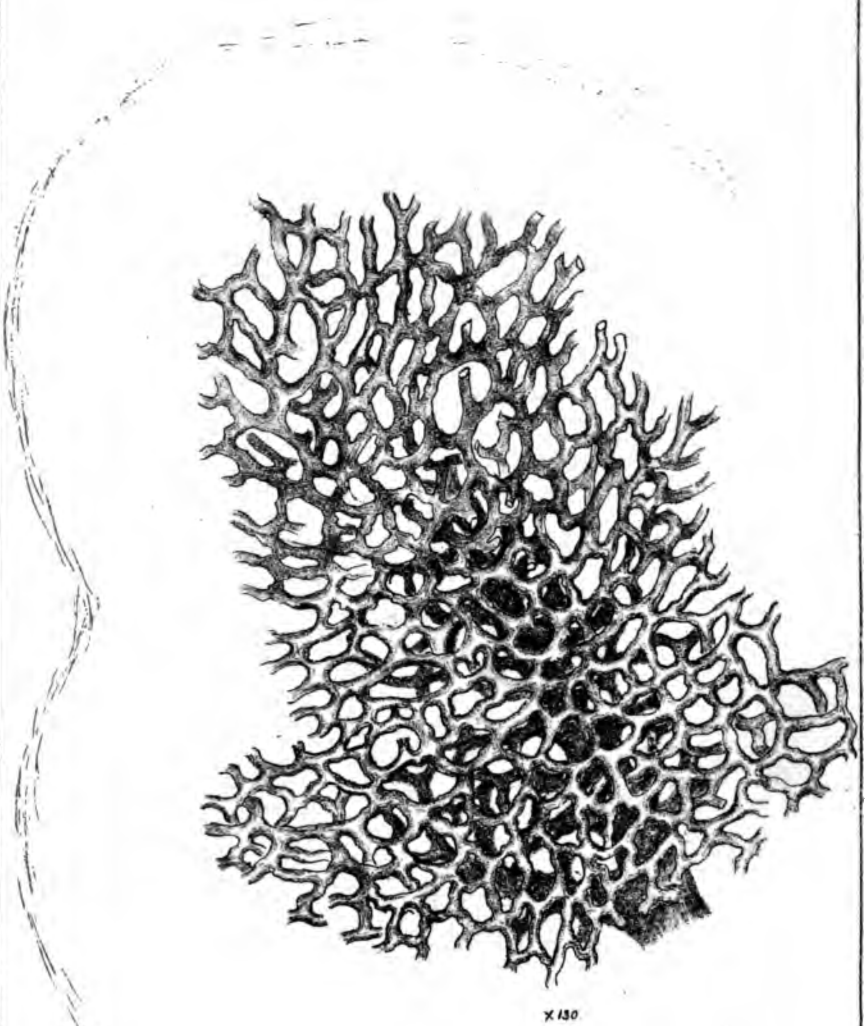
These peculiarities in the arrangement of the ducts of the squirrel's liver will be fully described in a future paper.

PLATE I.



PORTAL VEIN PIG'S LIVER. SECTION.

PLATE II.



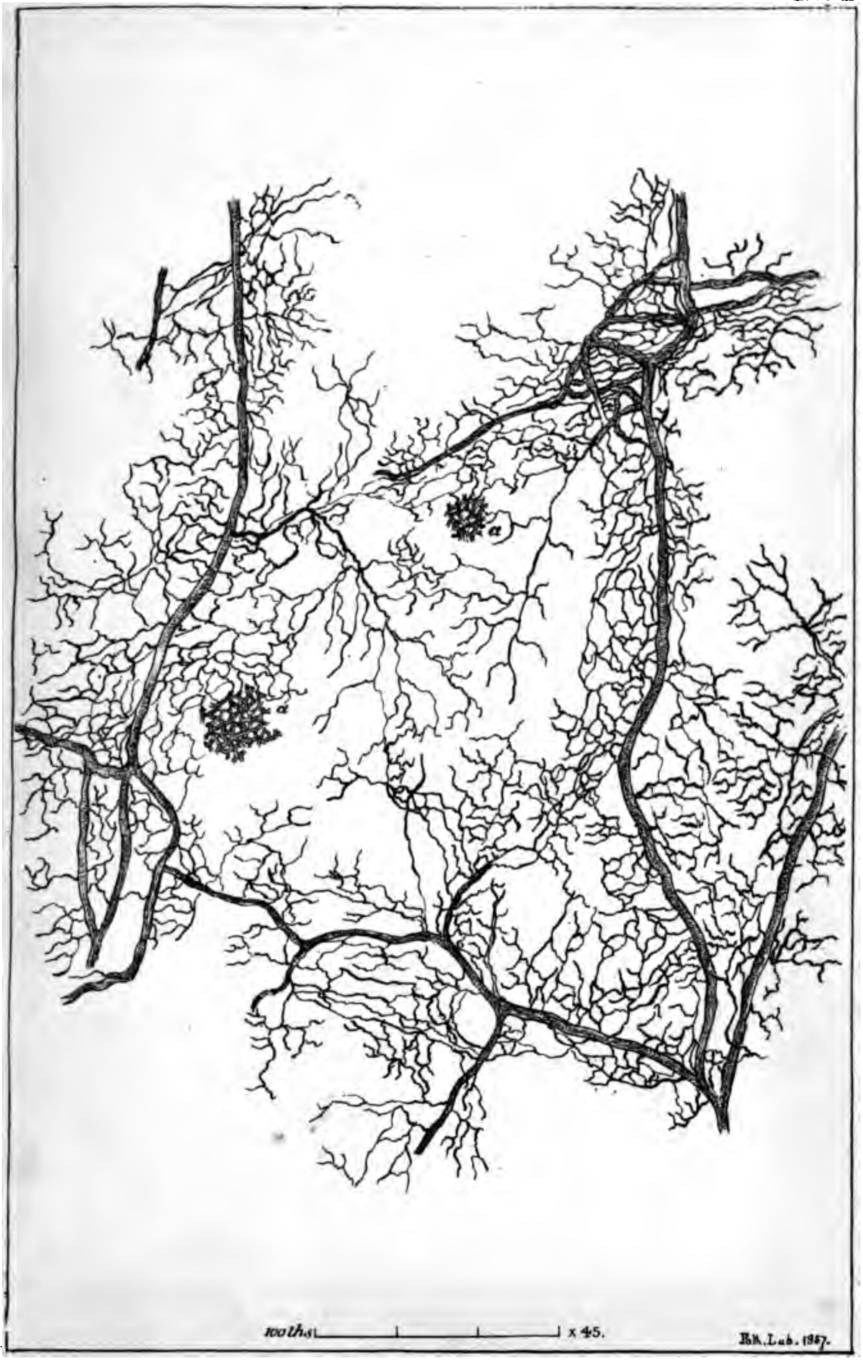
x 130

1000ths x 130

Path. Lab 1857.

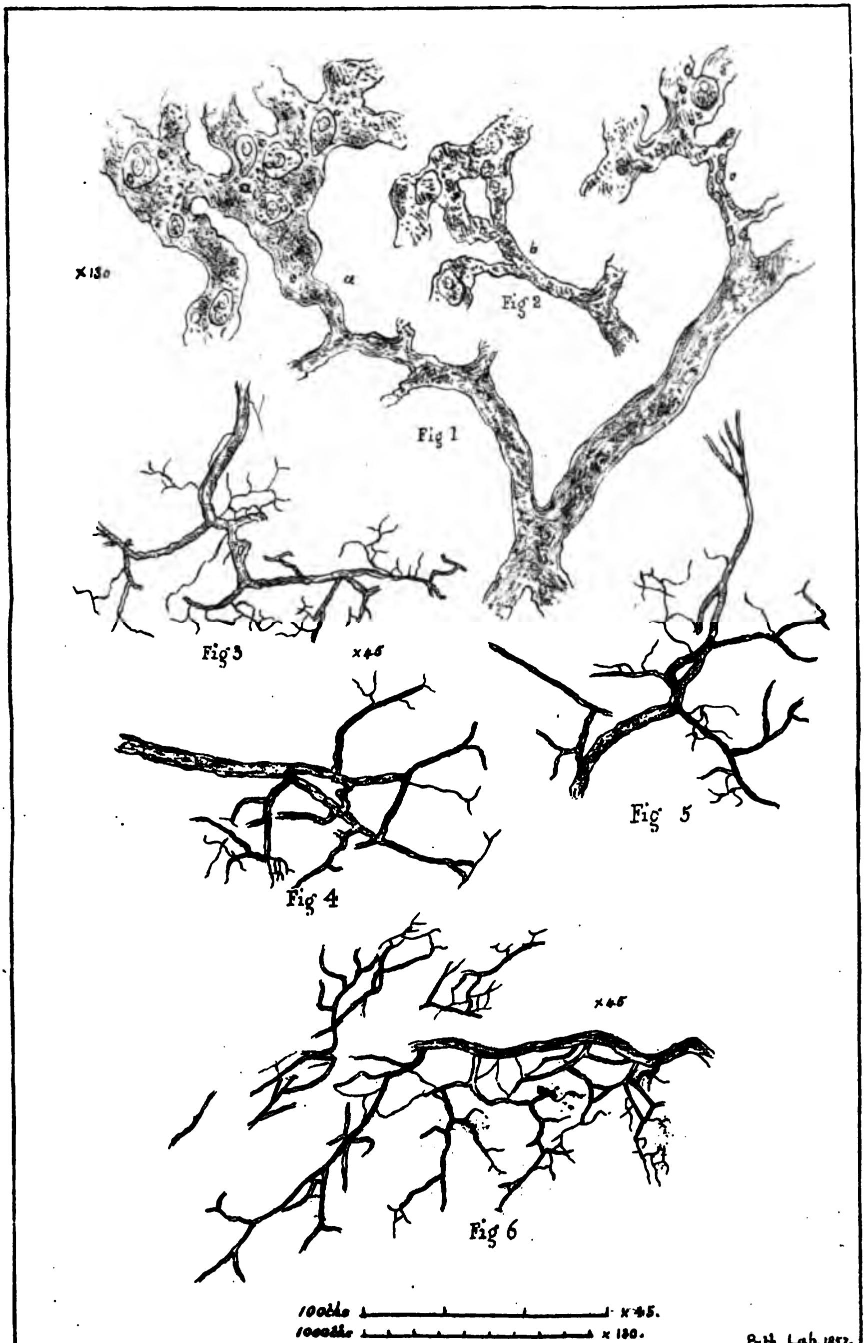
HEPATIC VEIN PIG'S LIVER. SECTION.

PLATE III.



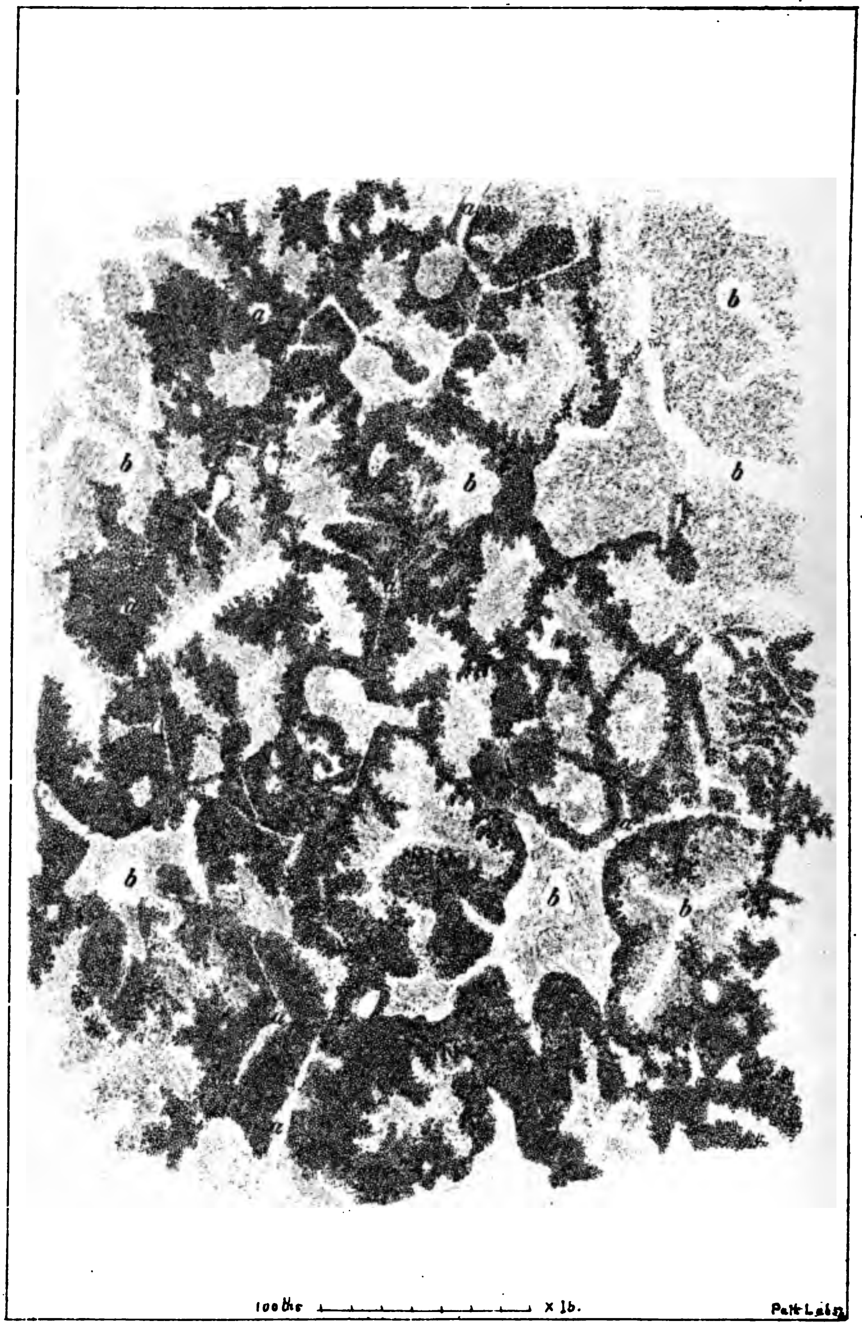
ARTERY. SURFACE of PIG'S LIVER. 45 D?.

PLATE IV.

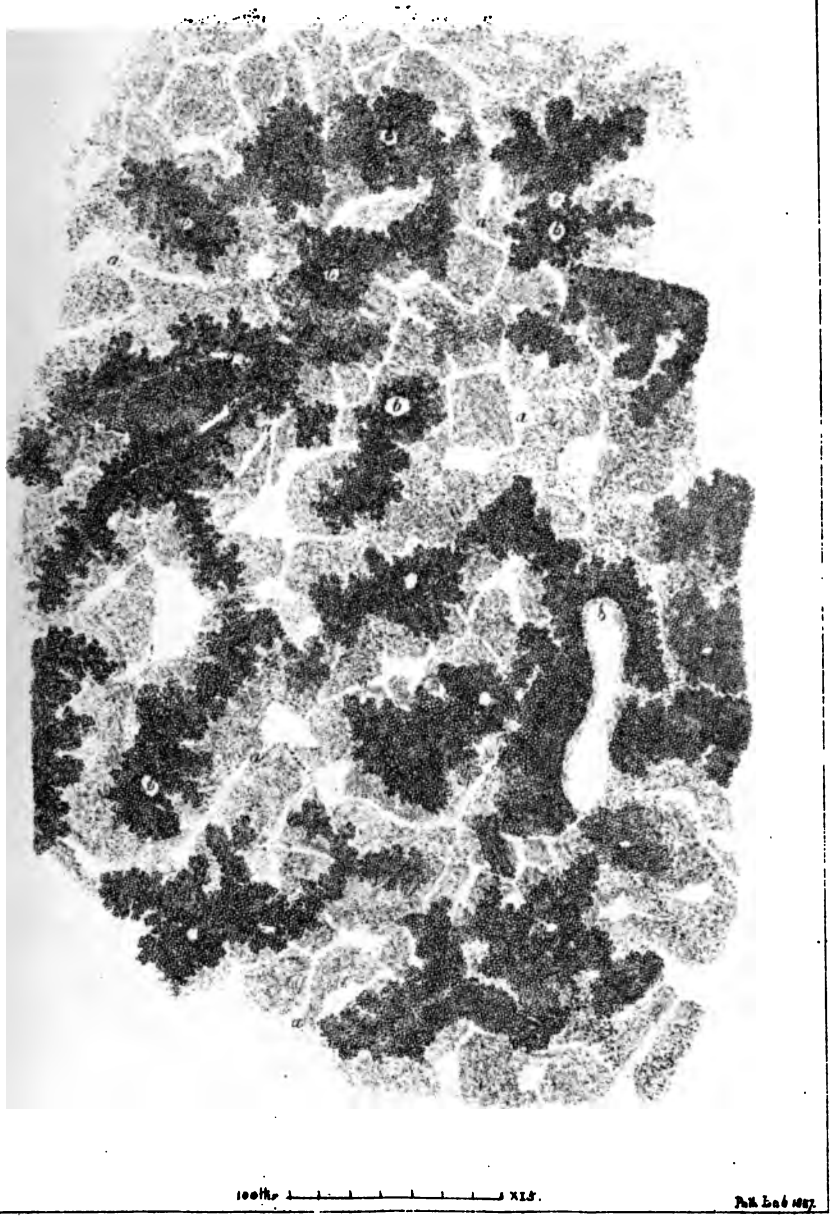


DUCT PIG'S LIVER.

PLATE



LIVER OF OX. PORTAL VEIN INJECTED x15.



LIVER OF OX. HEPATIC VEIN INJECTED x 15.

PLATE VII.

Fig 1.

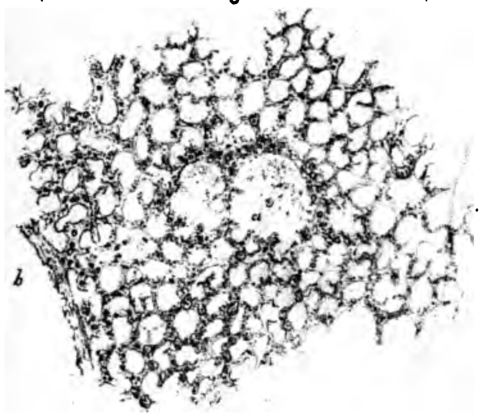
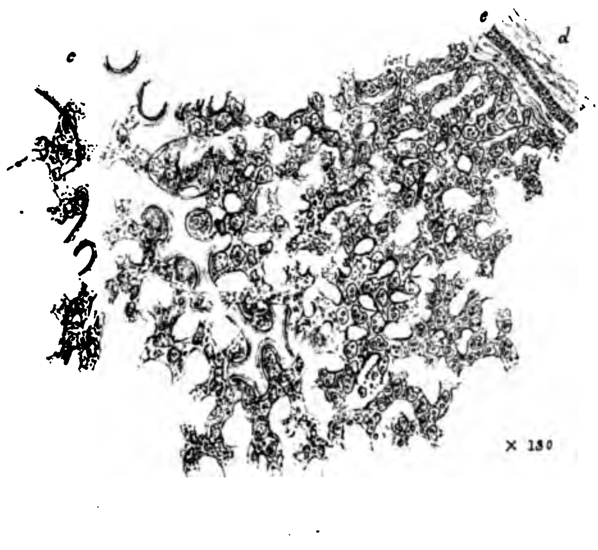


Fig 2.



1000ths × 130. Path. Lab. 1887.

LIVER CONTAINING CYSTS.

Fig 1. Small Cyst. Fig 2. Healthy portion.

PLATE V

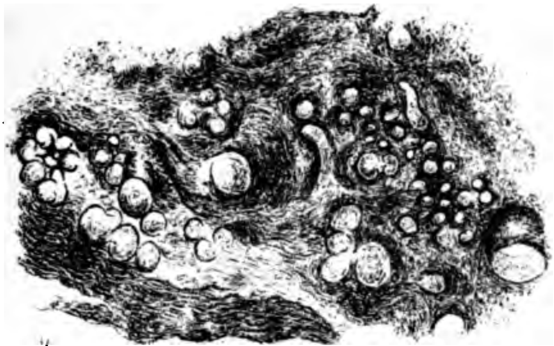
Fig 1

× 130

Fig 2

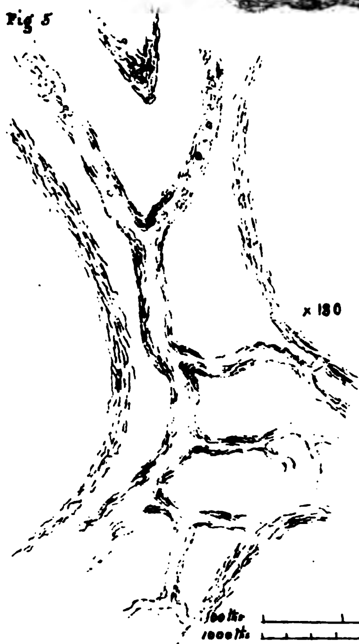
× 45

Fig 3



× 30

Fig 5



× 180

Fig 6

× 215

100ths × 45.
1000ths × 180.

Path. Lab 1857

1.2.3. FROM LIVER WITH DILATED DUCTS. 4.5 FROM LIVER WITH CYSTS. PLATE VII.

PLATE

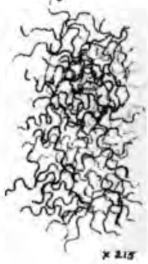
Fig 1

Fig 2

Fig 3.

Fig 4

Fig 5



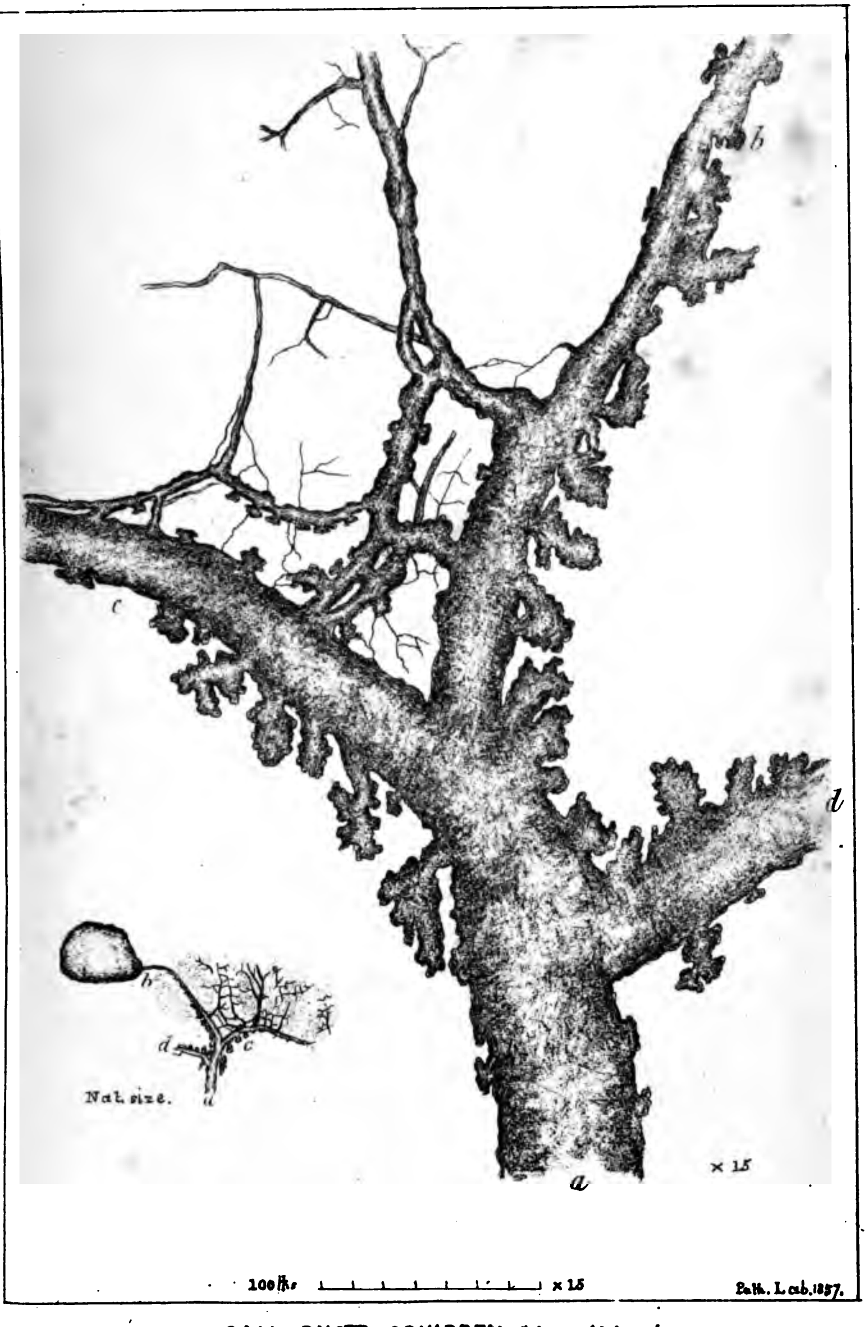
1000ths. × 130.

1000ths. × 215.

Path. Lab 1857.

1.2. Mass expectorated. 3. Tumor from Thyroid.
4.5. Tumor connected with Corpus Striatum.

PLATE



GALL DUCTS SQUIRREL. *Sciurus Vulgaris.*

NO V. WILL BE PUBLISHED IN MARCH.